0073590

Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

07-SED-0334 -Reissue

JUL 27 2007

Mr. John P. Martell, Manager
Radioactive Air Emissions Section
State of Washington
Department of Health
Office of Radiation Protection
Post Office Box 47827
Olympia, Washington 98504-7827

RECEIVED
AUG 06 2007
EDMC

Dear Mr. Martell:

RESPONSE TO HANFORD SITEWIDE ACTIONS IN NOTICE OF VIOLATION (NOV) AND COMPLIANCE ORDER ON EMISSION UNIT 296-S-21 AT THE 222-S LABORATORY

This letter responds to a State of Washington, Department of Health (WDOH) letter to Keith A. Klein, U.S. Department of Energy (DOE), Richland Operations Office, and Roy J. Schepens, DOE Office of River Protection (ORP), from Alvin W. Conklin, titled "Notice of Violation and Compliance Order," AIR 05-1103, dated November 17, 2005.

The NOV and Compliance Order cite deficiencies in the potential-to-emit (PTE) a radiological dose for the 296-S-21 Stack at the 222-S Laboratory. Order No. 3 of the NOV requires DOE to re-evaluate the PTE for each Hanford Site actively-ventilated, minor emission unit, at which the PTE was calculated using the Non-Destructive Assay method, back-calculation method, or was calculated according to any of the methods in Washington Administrative Code 246-247-030(21)(b, c, d, e) and without WDOH approval.

Enclosure 1 presents the Fluor Hanford, Inc. managed Hanford Stack PTE Evaluations, while Enclosure 2 includes the CH2M Hill Hanford Group, Inc. managed Stack PTE Evaluations.

If you have any questions, please contact me, or your staff may contact Doug S. Shoop, Assistant Manager for Safety and Engineering, on (509) 376-0108.

Sincerely,

Doug S. Shoop for

David A. Brockman
Manager

SED:MFJ

Enclosures

cc: See page 2

cc w/encls:
B. C. Barfuss, PNNL
J. M. Barnett, PNNL
J. A. Bates, FHI
G. Bohnee, NPT
D. L. Dyekman, FHI
R. Haggard, BNI
D. W. Hendrickson, Ecology
M. N. Jaraysi, CH2M
S. Harris, CTUIR
R. Jim, YN
C. J. Kemp, CH2M
J. J. Martell, WDOH, MSIN B1-42
P. C. Miller, CH2M
L. L. Penn, CH2M
K. A. Peterson , FHI
J. L. Nuzum, FHI
J. W. Schmidt, WDOH, MSIN B1-42
J. A. Voogd, CH2M
O. S. Wang, Ecology
P. A. Weiher, JCI
J. G. Woolard, WCH
D. Zhen, EPA Region 10, Seattle
Administrative Record (file:222S Laboratory Notice of Violation) TS-2-1-
Environmental Portal, A3-95

ENCLOSURE 1

The FH re-evaluation process started with a list of all actively ventilated radioactive air emission units from the FF-01 *The Department of Energy Hanford Site Radioactive Air Emissions License* as incorporated in the Hanford Site Air Operating Permit Renewal, effective January 1, 2007. This attachment 1 presents the final list of seven stacks for FH emission units that met the WDOH NOV evaluation criteria.

For those evaluations using only total alpha and total beta values, worst case isotopic dose factors were selected to represent a conservative total dose estimate.

STACK ASSESSMENT FOR 40 CFR 61, SUBPART H
BACK CALCULATION (3000ⁿ) SOURCE ASSESSMENT

Facility: 1706-KE

Discharge Point: 1706-KE

Number of HEPA Filter Banks	Height of release (m)	Back Calculation Factor (3000^n)
1.00E+00	7.6	3.00E+03

Radionuclide	Quantity Released (curies)	Back Calculation factor	Potentially Released (curies)	Offsite Unit Dose Factor (mrem/yr/curie)	Offsite Projected Dose (mrem/yr)
Total alpha (Am-241)	1.03E-07	3.00E+03	3.10E-04	2.50E+01	7.74E-03
Total beta (Cs-137)	5.16E-07	3.00E+03	1.55E-03	4.70E-01	7.28E-04
Total Dose					8.47E-03

	Emissions taken from DOE/RL-2001-32 "Radionuclide Air Emissions Report for the Hanford Site, Calendar Year 2000	Emissions taken from DOE/RL-2000-37 "Radionuclide Air Emissions Report for the Hanford Site, Calendar Year 1999	Emissions taken from DOE/RL-99-41 "Radionuclide Air Emissions Report for the Hanford Site, Calendar Year 1998	Emissions taken from DOE/RL-98-33 "Radionuclide Air Emissions Report for the Hanford Site, Calendar Year 1997	Average emissions from 1997-2000
Total alpha	3.00E-08	2.90E-09	1.90E-07	1.90E-07	1.03E-07
Total beta	1.50E-07	3.50E-08	7.80E-07	1.10E-06	5.16E-07

Method Used to Calculate Dose (CAP88-PC) X

Comments: This table represents a determination for designation of a stack being major or minor. Therefore, the quantification of the PTE in this table should not be used other than for that purpose.

Evaluator: Gerald S Hunacek Jr Date: 9/24/02

Environmental Compliance Officer: D J Watson Date: 9/24/02

Evaluator: Gerald S Hunacek Jr Gerald S. Hunacek Jr Date: 6/12/07

Environmental Compliance Officer: D J Watson DJ Watson Date: 6/12/07

POTENTIAL-TO-EMIT PEER-REVIEW CHECKLIST

Source of PTE Factors: *Calculating Potential-to-Emit Radiological Releases and Doses* (DOE/RL-2006-29)

PTE Application: HNF-1974-1, page APP-A1-10, Facility: 1706KE
Description of application (e.g., NOC or stack determination)

Yes	No	NA	
[X]	[ ]	[ ]	Assumptions and/or factors explicitly stated and supported, which include approved PTE method used (or description of alternate method, if applicable), radionuclide inventory, and, as applicable, pollution abatement equipment in use.
[X]	[ ]	[ ]	Decontamination factors, airborne dose factors, releases fractions, and/or similar emission reduction factors accurately used in calculations and technically justified.
[X]	[ ]	[ ]	Applicable pollution abatement equipment entirely accounted for in calculations.
[X]	[ ]	[ ]	Appropriate dose-per-unit-release factors and/or facility-specific calculations were used.
[X]	[ ]	[ ]	Sources of data used in calculations identified.
[X]	[ ]	[ ]	Mathematical formulas accurate.
[X]	[ ]	[ ]	Hand-calculations (including spreadsheets) checked for errors.
[X]	[ ]	[ ]	Sufficient documentation is available to support all essential aspects of the PTE determination.

[X] [ ] **Document prepared by/approved by:**

Gerald S Hunacek Jr	Dave J Watson
Name, printed	Name, printed

Approval Signature: Gerald S Hunacek Jr   Date: 6/12/07

Approval Signature: D J Watson   Date: 6/12/07

HNF-26241
Revision 0

Unabated Radionuclide Emissions Estimate for the 209E 296-P-31 Stack

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Project Hanford Management Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

Fluor Hanford
P.O. Box 1000
Richland, Washington

Approved for Public Release;
Further Dissemination Unlimited

Table 2. 209E Historical Emissions

Year	Total Alpha (Ci)	Total Beta (Ci)
1997	2.9 E-10	1.3 E-08
1998	7.9 E-09	1.6 E-08
1999	2.1 E-08	5.0 E-08
2000	1.5 E-08	3.6 E-08
2001	5.1 E-09	1.8 E-08
2002	6.7 E-09	4.1 E-08
2003	0	4.3 E-08
2004	5.3 E-09	4.4 E-08
Total =	**6.1 E-08**	**2.6 E-07**

Table 3. 209E Potential to Emit Radionuclides

Isotope	Potential to Emit (PTE) Radionuclides (Ci)	Annualized Radionuclide PTE[a] (Ci/yr)	Dose Factor[b] (offsite) (mrem/Ci)	Dose (offsite) (mrem/yr)	Dose %
^{241}Am	1.2 E-05	1.4 E-06	1.3 E+01	1.8 E-05	**35.8%**
^{137}Cs	5.3 E-08	6.4 E-09	2.4 E-01	1.5 E-09	0.0%
$^{239/240}$Pu	2.3 E-05	2.8 E-06	8.2 E+00	2.3 E-05	**45.7%**
^{244}Pu/^{244}Cm[f]	3.7 E-13	4.4 E-14	7.8 E+00	3.4 E-13	0.0%
^{242}Pu/Am[g]	3.5 E-09	4.2 E-10	7.8 E+00	3.3 E-09	0.0%
^{241}Pu/Am[h]	4.2 E-04	5.0 E-05	1.3 E-01	6.5 E-06	**12.9%**
^{238}Pu	3.0 E-06	3.6 E-07	7.6 E+00	2.7 E-06	**5.4%**
$^{89/90}$Sr	1.1 E-07	1.3 E-08	1.1 E-01	1.4 E-09	0.0%
^{233}U	1.7 E-10	2.0 E-11	3.1 E+00	6.2 E-11	0.0%
^{234}U	4.0 E-10	4.8 E-11	3.1 E+00	1.5 E-10	0.0%
^{235}U	4.1 E-12	4.9 E-13	3.0 E+00	1.5 E-12	0.0%
^{236}U	7.6 E-12	9.1 E-13	2.9 E+00	2.6 E-12	0.0%
^{238}U	5.5 E-11	6.6 E-12	2.8 E+00	1.9 E-11	0.0%
Total Alpha[c]	6.1 E-08	7.6 E-09[d]	1.3 E+01[e]	9.9 E-08	0.2%
Total Beta[c]	2.6 E-07	3.3 E-08[d]	1.1 E-01[f]	3.6 E-09	0.0%
			Total =	**5.0 E-05**	100.0%

[a] Filters operated from 12/96 through 4/05 for 8.33 years of operation.
[b] Dose factors from HNF-3602-1 *Unit Dose Conversation Factors to Calculate Dose for NOCs and FEMPs.*
[c] Actual emissions taken from annual Radioactive Air Emissions Reports.
[d] Divided by 8 years to annualize values.
[e] ^{241}Am dose factor used for conservatism.
[f] ^{90}Sr dose factor used for conservatism.

POTENTIAL-TO-EMIT PEER-REVIEW CHECKLIST

Source of PTE Factors: *Calculating Potential-to-Emit Radiological Releases and Doses* (DOE/RL-2006-29)

PTE Application: 209E 296-P-31
Description of application (e.g., NOC or stack determination)

Yes	No	NA	
[✓]	[ ]	[ ]	Assumptions and/or factors explicitly stated and supported, which include approved PTE method used (or description of alternate method, if applicable), radionuclide inventory, and, as applicable, pollution abatement equipment in use. All information contained in HNF-26241
[✓]	[ ]	[ ]	Decontamination factors, airborne dose factors, releases fractions, and/or similar emission reduction factors accurately used in calculations and technically justified.
[✓]	[ ]	[ ]	Applicable pollution abatement equipment entirely accounted for in calculations.
[✓]	[ ]	[ ]	Appropriate dose-per-unit-release factors and/or facility-specific calculations were used.
[✓]	[ ]	[ ]	Sources of data used in calculations identified.
[✓]	[ ]	[ ]	Mathematical formulas accurate.
[✓]	[ ]	[ ]	Hand-calculations (including spreadsheets) checked for errors.
[✓]	[ ]	[ ]	Sufficient documentation is available to support all essential aspects of the PTE determination.

[ ] [ ] **Document reviewed by:** D.L. DYEKMAN
Name, printed

Signature: DL Dy Date: 6/22/07

STACK ASSESSMENT FOR
40 CFR 61, SUBPART H

BACK CALCULATION SOURCE ASSESSMENT

FACILITY S Plant DISCHARGE POINT 291-S-1

Sand Filter 1 BACK CALCULATION FACTOR 500

Annual Air Emissions Report (year) Average emissions (Ci/yr) from annual reports, 1990-2003

Radionuclide	Quantity Released (Curies)	Treatment Factor	Potential Quantity Released (curies)	Projected Dose (mrem/yr)
Total α (as Am-241)	4.2 E-07	500	2.1 E-04	2.3 E-03
Total β/γ (as Cs-137)	1.6 E-06	500	8.0 E-04	1.7 E-04
			Total Dose	2.5 E-03

Method Used to Project Dose: (HNF-3602, Rev. 1) CAP88-PC Unit Dose Factors for MPR at LIGO (200W, Stack > 40 m): Am-241 = 11 mrem/Ci; Cs-137 = 0.21 mrem/Ci

COMMENTS

Efficiency of Sand Filter is reported as 99.8% in *Calendar Year 1990 Air Emissions Report for the Hanford Site* (DOE/RL-91-10).

The treatment factor for sand filters is reported as the inverse of one minus 99.8% (i.e., 500) in *Unit Dose Calculation Methods and Summary of Facility Effluent Monitoring Plan Determinations* (WHC-EP-0498, November 1991).

Collection efficiency reported as 99.5% in *Sand-Bed Filtration of Aerosols: A Review of Published Information on their Use in Industrial and Atomic Energy Facilities*, Argonne National Laboratory (ANL-7683, June 1970).

EVALUATOR Russell E Johnson DATE 3/8/05

MANAGER, FH/EP-M&R [signature] DATE 3-8-05

FACILITY MANAGER/ECO [signature] DATE 8 MAR '05

POTENTIAL-TO-EMIT PEER-REVIEW CHECKLIST

Source of PTE Factors: *Calculating Potential-to-Emit Radiological Releases and Doses* (DOE/RL-2006-29)

PTE Application: 291-S-1 Stack designation
Description of application (e.g., NOC or stack designation)

Yes	No	NA	
[✓]	[ ]	[ ]	Assumptions and/or factors explicitly stated and supported, which include approved PTE method used (or description of alternate method, if applicable), radionuclide inventory, and, as applicable, pollution abatement equipment in use.
[✓]	[ ]	[ ]	Decontamination factors, airborne dose factors, releases fractions, and/or similar emission reduction factors accurately used in calculations and technically justified.
[✓]	[ ]	[ ]	Applicable pollution abatement equipment entirely accounted for in calculations.
[✓]	[ ]	[ ]	Appropriate dose-per-unit-release factors and/or facility-specific calculations were used. HNF-3602 dose factors identical to DOE/RL-2006-29.
[✓]	[ ]	[ ]	Sources of data used in calculations identified.
[✓]	[ ]	[ ]	Mathematical formulas accurate.
[✓]	[ ]	[ ]	Hand-calculations (including spreadsheets) checked for errors.
[✓]	[ ]	[ ]	Sufficient documentation is available to support all essential aspects of the PTE determination.

[✓] [ ] **Document reviewed by:** D. L. Dyekman
Name, printed

Review Signature: [signature] Date: 6/23/07

STACK ASSESSMENT FOR
40 CFR 61, SUBPART H

BACK CALCULATION SOURCE ASSESSMENT

FACILITY U Plant DISCHARGE POINT 291-U-1

Sand Filter 1 BACK CALCULATION FACTOR 500

Annual Air Emissions Report (year) Average emissions (Ci/yr) from annual reports, 1990-2003

Radionuclide	Quantity Released (Curies)	Treatment Factor	Potential Quantity Released (curies)	Projected Dose (mrem/yr)
Total α (as Am-241)	7.9 E-07	500	4.0 E-04	4.3 E-03
Total β/γ (as Cs-137)	1.5 E-04	500	7.5 E-02	1.6 E-02
			Total Dose	2.0 E-02

Method Used to Project Dose: (HNF-3602, Rev. 1) CAP88-PC Unit Dose Factors for MPR at LIGO (200W, Stack > 40 m): Am-241 = 11 mrem/Ci; Cs-137 = 0.21 mrem/Ci

COMMENTS

Efficiency of Sand Filter is reported as 99.8% in *Calendar Year 1990 Air Emissions Report for the Hanford Site* (DOE/RL-91-10).

The treatment factor for sand filters is reported as the inverse of one minus 99.8% (i.e., 500) in *Unit Dose Calculation Methods and Summary of Facility Effluent Monitoring Plan Determinations* (WHC-EP-0498, November 1991).

Collection efficiency reported as 99.5% in *Sand-Bed Filtration of Aerosols: A Review of Published Information on their Use in Industrial and Atomic Energy Facilities*, Argonne National Laboratory (ANL-7683, June 1970).

EVALUATOR Russell E Johnson DATE 3/8/05

MANAGER, FH/EP-M&R [signature] DATE 3-8-05

FACILITY MANAGER/ECO [signature] DATE 8 Mar '05

POTENTIAL-TO-EMIT PEER-REVIEW CHECKLIST

Source of PTE Factors: *Calculating Potential-to-Emit Radiological Releases and Doses* (DOE/RL-2006-29)

PTE Application: 291-U-1 Stack designation
Description of application (e.g., NOC or stack designation)

Yes	No	NA	
[✓]	[ ]	[ ]	Assumptions and/or factors explicitly stated and supported, which include approved PTE method used (or description of alternate method, if applicable), radionuclide inventory, and, as applicable, pollution abatement equipment in use.
[✓]	[ ]	[ ]	Decontamination factors, airborne dose factors, releases fractions, and/or similar emission reduction factors accurately used in calculations and technically justified.
[✓]	[ ]	[ ]	Applicable pollution abatement equipment entirely accounted for in calculations.
[✓]	[ ]	[ ]	Appropriate dose-per-unit-release factors and/or facility-specific calculations were used. HNF-3602 dose factors identical to DOE/RL-2006-29.
[✓]	[ ]	[ ]	Sources of data used in calculations identified.
[✓]	[ ]	[ ]	Mathematical formulas accurate.
[✓]	[ ]	[ ]	Hand-calculations (including spreadsheets) checked for errors.
[✓]	[ ]	[ ]	Sufficient documentation is available to support all essential aspects of the PTE determination.
[✓]	[ ]		**Document reviewed by:** D. L. Dyekman (Name, printed)

Review Signature: [signature] Date: 6/22/07

POTENTIAL-TO-EMIT RADIONUCLIDES ESTIMATE

Facility: 340 Building FMS 6/25/07 Discharge Point: **340 Decon**

Release height (m): ~~#~~ 8.2 Number of HEPA filter banks (n): 2

Decon Area Floor						
Radionuclide	Floor surface area	Surface Contamination[a] (dpm/100 cm^2)	Appendix D Release Fraction[b]	Potential Curies Released (Ci)	Offsite Dose Factor[c] (west) (mrem/yr/curie)	Offsite Potential Dose (west) Mrem/yr
Total Beta (Sr-90)	(42'8" x 40') (0.0929 m^2/ft^2) = 158.6 m^2	100,000	0.001	7.1 E-7	1.9E+00	1.4 E-6
Total Alpha (Am-241)		2000	0.001	1.4 E-8	2.2E+02	3.1 E-6

Sump Liquid						
Radionuclide	Sump water volume (3' x 3' x 3')	Water Sample Results (pCi/Liter)	Appendix D Release Fraction[b]	Potential Curies Released (Ci)	Offsite Dose Factor[c] (west) (mrem/yr/curie)	Offsite Potential Dose (west) Mrem/yr
Total Beta (Sr-90)	765 Liters	4.6 E+5	0.001	3.5 E-7	1.9E+00	6.7 E-7
Total Alpha (Am-241)		3.9 E+3	0.001	3.0 E-9	2.2E+02	6.6 E-7

Sump Wall						
Radionuclide	Dry Sump Wall + Floor Surface Area (5 x 3' x 3')	Surface Contamination[a] (dpm/100 cm^2)	Appendix D Release Fraction[b]	Potential Curies Released (Ci)	Offsite Dose Factor[c] (west) (mrem/yr/curie)	Offsite Potential Dose (west) Mrem/yr
Total Beta (Sr-90)	(5 x 3'x 3')(0.0929 m^2/ft^2) = 4.2 m^2	100,000	0.001	1.9 E-8	1.9E+00	3.6 E-8
Total Alpha (Am-241)		2000	0.001	3.8 E-10	2.2E+02	8.4 E-8

Hood Interior						
Radionuclide	Sample Hood Dimensions (floor + 4 walls)	Surface Contamination[a] (dpm/100 cm^2)	Appendix D Release Fraction[b]	Potential Curies Released (Ci)	Offsite Dose Factor[c] (west) (mrem/yr/curie)	Offsite Potential Dose (west) Mrem/yr
Total Beta (Sr-90)	(5 x 5' x 5')(0.0929 m^2/ft^2) = 11.6 m^2	100,000	0.001	5.2 E-8	1.9E+00	9.9 E-8
Total Alpha (Am-241)		2000	0.001	1.1 E-9	2.2E+02	2.4 E-7

Total Dose =	**6.3 E-6 mrem/yr**

[a] Source: radiological survey data; all values used are greater than recent survey data.

[b] Source: 40 CFR 61 Appendix D.

[c] Source: DOE/RL-2006-29 *Calculating Potential-to-Emit Radiological Releases and Doses.*

Evaluator: R.T. Stordeur / [signature] Date: 6-25-07

Environmental Compliance Officer: [signature] Date: 6-25-07

POTENTIAL-TO-EMIT PEER-REVIEW CHECKLIST

Source of PTE Factors: *Calculating Potential-to-Emit Radiological Releases and Doses* (DOE/RL-2006-29)

PTE Application: 340 Decon Stack designation
Description of application (e.g., NOC or stack designation)

Yes	No	NA	
[✓]	[ ]	[ ]	Assumptions and/or factors explicitly stated and supported, which include approved PTE method used (or description of alternate method, if applicable), radionuclide inventory, and, as applicable, pollution abatement equipment in use.
[✓]	[ ]	[ ]	Decontamination factors, airborne dose factors, releases fractions, and/or similar emission reduction factors accurately used in calculations and technically justified.
[✓]	[ ]	[ ]	Applicable pollution abatement equipment entirely accounted for in calculations.
[✓]	[ ]	[ ]	Appropriate dose-per-unit-release factors and/or facility-specific calculations were used.
[✓]	[ ]	[ ]	Sources of data used in calculations identified. NOTE: SUMP WATER VOLUME = 0.
[✓]	[ ]	[ ]	Mathematical formulas accurate.
[✓]	[ ]	[ ]	Hand-calculations (including spreadsheets) checked for errors.
[✓]	[ ]	[ ]	Sufficient documentation is available to support all essential aspects of the PTE determination.

[✓] [ ] **Document reviewed by:** D. L. Dyekman
Name, printed

Review Signature: D. L. Dy

Date: 6/25/07

STACK ASSESSMENT FOR 40 CFR 61, SUBPART H
NONDESTRUCTIVE ASSESSMENT [NDA]

Facility: MASF
Release height (m): 9.1
Prefilter: ☒ Yes ☐ No

Discharge Point: 437-MN&ST
Number of HEPA filter banks (n): 2

Radionuclide	Quantity (curies)	Offsite Unit Dose Factor (mrem/yr/curie)	Onsite Unit Dose Factor (mrem/yr/curie)	Offsite Projected Dose (mrem/yr)	Onsite Projected Dose (mrem/yr)
Cs-137	7.69E-05	3.50E-01	8.50E-01	2.69E-05	6.54E-05
Co-60	1.30E-04	3.60E-01	9.50E-01	4.68E-05	1.24E-04
Mn-54	0.2	2.40E-02	6.40E-02	4.80E-03	1.28E-02
Total beta (Cs-137)	7.80E-05	3.50E-01	8.50E-01	2.73E-05	6.63E-05
Total alpha (Pu-239)	2.00E-05	1.20E+01	3.00E+01	2.40E-04	6.00E-04
Total Dose				5.14E-03	1.37E-02

Method Used to Calculate Dose (CAP88-PC) X

Comments:

Evaluator: N R Dyhl Date: 8/28/02
Environmental Compliance Officer: CA Rasch Date: 8/29/02
Facility Manager: Steven Doehler Date: 8/29/02

POTENTIAL-TO-EMIT PEER-REVIEW CHECKLIST

Source of PTE Factors: *Calculating Potential-to-Emit Radiological Releases and Doses* (DOE/RL-2006-29)

PTE Application: 437-MN&ST Stack designation
Description of application (e.g., NOC or stack designation)

Yes	No	NA	
[✓]	[ ]	[ ]	Assumptions and/or factors explicitly stated and supported, which include approved PTE method used (or description of alternate method, if applicable), radionuclide inventory, and, as applicable, pollution abatement equipment in use.
[✓]	[ ]	[ ]	Decontamination factors, airborne dose factors, releases fractions, and/or similar emission reduction factors accurately used in calculations and technically justified.
[✓]	[ ]	[ ]	Applicable pollution abatement equipment entirely accounted for in calculations.
[✓]	[ ]	[ ]	Appropriate dose-per-unit-release factors and/or facility-specific calculations were used. HNF-3602 dose factors identical to DOE/RL-2006-29.
[✓]	[ ]	[ ]	Sources of data used in calculations identified. Source term document WHC-SD-ER-TP-012.
[✓]	[ ]	[ ]	Mathematical formulas accurate.
[✓]	[ ]	[ ]	Hand-calculations (including spreadsheets) checked for errors.
[✓]	[ ]	[ ]	Sufficient documentation is available to support all essential aspects of the PTE determination.

NOTE: Stack PTE calculation confirmed during WDOH audit #480, March 2006.

[ ] [ ] **Document reviewed by:** D. L. Dyekman
Name, printed

Review Signature: DL Dy

Date: 6/22/07

STACK ASSESSMENT FOR 40 CFR 61, SUBPART H
NONDESTRUCTIVE ASSESSMENT [NDA]

Facility: MASF
Release height (m): 11.7
Prefilter: ☒ Yes ☐ No

Discharge Point: **437-1-61**
Number of HEPA filter banks (n): 2

Radionuclide	Quantity (curies)	Offsite Unit Dose Factor (mrem/yr/curie)	Onsite Unit Dose Factor (mrem/yr/curie)	Offsite Projected Dose (mrem/yr)	Onsite Projected Dose (mrem/yr)
Cs-137	5.60E-07	3.50E-01	8.50E-01	1.96E-07	4.76E-07
Total Dose				1.96E-07	4.76E-07

Method Used to Calculate Dose (CAP88-PC) X

Comments:

Evaluator: [signature] Date: 8/28/02
Environmental Compliance Officer: [signature] Date: 8/29/02
Facility Manager: Steven Doelder Date: 8/29/02

POTENTIAL-TO-EMIT PEER-REVIEW CHECKLIST

Source of PTE Factors: *Calculating Potential-to-Emit Radiological Releases and Doses* (DOE/RL-2006-29)

PTE Application: 437-1-61 Stack designation
Description of application (e.g., NOC or stack designation)

Yes	~~No~~	NA	
[✓]	[ ]	[ ]	Assumptions and/or factors explicitly stated and supported, which include approved PTE method used (or description of alternate method, if applicable), radionuclide inventory, and, as applicable, pollution abatement equipment in use.
[✓]	[ ]	[ ]	Decontamination factors, airborne dose factors, releases fractions, and/or similar emission reduction factors accurately used in calculations and technically justified.
[✓]	[ ]	[ ]	Applicable pollution abatement equipment entirely accounted for in calculations.
[✓]	[ ]	[ ]	Appropriate dose-per-unit-release factors and/or facility-specific calculations were used. HNF-3602 dose factors identical to DOE/RL-2006-29.
[✓]	[ ]	[ ]	Sources of data used in calculations identified. Source term document WHC-SD-ER-TP-012.
[✓]	[ ]	[ ]	Mathematical formulas accurate.
[✓]	[ ]	[ ]	Hand-calculations (including spreadsheets) checked for errors.
[✓]	[ ]	[ ]	Sufficient documentation is available to support all essential aspects of the PTE determination.

NOTE: Stack PTE calculation confirmed during WDOH audit #480, March 2006.

[ ] [ ] **Document reviewed by:** D. L. Dyekman
Name, printed

Review Signature: [signature]

Date: 6/22/07

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Tank Farms Stack Designation Determinations

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Abstract: This document identifies the appropriate Tank Farm exhauster stack designations as required by the 40 CFR 61, subpart H, National Emission Standards for Hazardous Air Pollutants (NESHAP), Other than Radon from Department of Energy Facilities.

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Tank Farm Stack Designation Determinations

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APPENDICES

ABBREVIATIONS AND ACRONYMS

ALARA	as low as reasonably achievable
ANSI	American National Standards Institute
APQ	annual possession quantity
ASTM	American Society for Testing and Materials
BBI	best-basis inventory
CCIP	Contamination Control Improvement Program
CFM	cubic feet per minute
CFR	Code of Federal Regulations
DCRT	double-contained receiver tank
DOE	Department of Energy
DOT	Department of Transportation
DST	double-shell tank
EPA	Environmental Protection Agency
FEMP	Facility Effluent Monitoring Plan
HEPA	high-efficiency particulate air
HIHTL	hose-in-hose transfer line
HPS	Health Physics Society
LIGO	Laser Interferometer Gravitational Wave Observatory
MEI	maximally exposed individual
MPR	maximum public receptor
NESHAP	National Emission Standards for Hazardous Air Pollutants
NDA	non-destructive assay
NOC	notice of construction
ORP	Office of River Protection
PIC	potential impact category
PTE	potential to emit
REDOX	reduction and oxidation
SST	single-shell tank
TEDE	total effective dose equivalent
TMACS	Tank Monitor and Control System
TWINS	Tank Waste Information Network System
WAC	Washington Administrative Code
WDOH	State of Washington, Department of Health
WG	water glass
WTP	Waste Treatment Plant

1.0 PURPOSE

The primary purpose of this document is to identify the appropriate Tank Farm exhauster stack designations as required by the 40 CFR 61, subpart H, *National Emission Standards for Hazardous Air Pollutants* (NESHAP), *Other than Radon from Department of Energy Facilities.*

The NESHAP regulation establishes a radionuclide emission limit of 10 mrem off site for the entire Hanford Site to any member of the public. NESHAP requires that if any one emission point could potentially cause any member of the public to be exposed to greater than 0.1 mrem per year, then the emissions must be measured at that point continuously in accordance with specific methods and standards identified in the regulations. EPA approval or equivalency can be obtained for measurements by alternate means if it is shown that the emissions are not significantly underestimated in so doing. If the emission point is shown to result in potentially less than or equal to 0.1 mrem per year, then only periodic confirmatory measurements are required.

2.0 SCOPE

The original stack designation determination was performed in 1993 and published in HNF-SD-WM-EMP-031, *Tank Farm Stack NESHAP Designation Determination.* Over time, the stack designations were revised as changes to operations caused variations in emissions. Additional catalysts to changes in emissions were relocation of the closest member of the public and periodic updates to the CAP-88 dispersion model used at the Hanford site.

This document builds upon and updates the last assessment performed in 1997 and published as Rev. 3A of SD-WM-EMP-031. All potentially contaminated emission points with active exhaust systems in the Tank Farms have been evaluated. Each section includes a brief description of the stack system, an explanation of the assumptions used to determine the source term or Annual Possession Quantity (APQ), the calculation of the potential off site doses, and identification of each tank system as "Designated" (major) or "Non-designated" (minor).

3.0 DESIGNATION METHODS

Various methods are used, as allowed by regulations, to assess potential emissions from each of the stacks presented in this document. These methods are described in the following subsections.

3.1 Appendix D from 40 CFR 61

The predominating method employed in the assessments contained in this document is cited in Appendix D of 40 CFR Part 61, *National emission standards for hazardous air pollutants.* For use of this method, the activity level and the physical state for each radionuclide must be known. The activity level is determined from the inventory of radionuclides in each tank. Appendix D provides release factors that depend on the physical state of the radionuclide. These factors are "1" for gases, "1E-3" for liquids or particulates, and "1E-6" for solids. The activity level is multiplied by the release factor to calculate the amount of activity for each radionuclide that would be available for emission to the atmosphere if no controls (e.g., HEPA filtration) were available. The releasable amount is multiplied by a dose conversion factor for each radioisotope, derived from a site specific dispersion model (CAPP-88 PC), to estimate the potential off site dose due to that specific radioisotope. The potential doses for all of the radioisotopes are added to calculate the total potential off site dose due to the entire source inventory in a tank or Tank Farm. For the NESHAP calculations, it is assumed that there is no filtration in place as specified in 40 CFR 61.93(b)(4)(ii) concerning engineered emission controls.

3.2 Non-Destructive Assay (NDA)

Potential emissions are defined in 40 CFR 61.93 as those emissions that might result over the course of an entire year if the emission controls were not in place and functional. NDA results can be used to determine this. An NDA determines the radiological activity measured on the exhauster components (demister, pre-filter, and all HEPA filters). An annual release rate is calculated based on the radionuclide inventory of the control device, its operating history, and its collection efficiency. The potential emissions are then calculated by dividing the annual release rate by the collection efficiency of the control device.

3.3 HEPA Filter Disposal Assay

Another method for determining the potential emissions for a particular emission unit is to perform a HEPA (High Efficiency Particulate Air) filter storage and disposal assay to determine what the filters collected. This method is based directly on the requirement specified in 40 CFR 61.93 that directs potential emissions be determined without any emission controls in place. Emission controls for Tank Farm exhausters consist primarily of two High Efficiency Particulate Air (HEPA) filter installed in series. Each HEPA filter bank is rated at 99.97% efficient for removal of 0.3 micron sized particles and are periodically tested to 99.95%. In this case the curie content collected on these filters would represent 99.95% of the potential emission during the time the HEPAs were in use while the exhauster was in operation. In other words, potential emissions are 1.0005 times what the first filter stage catches. If the quantity on two HEPAs in series is know, the potential emissions can still be computed by multiplying the captured quantity by 1.00000025. Both these factors result in little to no change in emissions from that captured on the first HEPA filter.

Assays are performed when the HEPA filters are changed out. They are necessary to fully characterize the waste for storage and ultimate disposal. Standard methods are used for these assays.

It is expected that potential emission results from these assays provides a more realistic account than use of source term data using 40 CFR 61, Appendix D release factors. This is because use of Appendix D release factors is generally regarded as a very conservative method.

3.4 Dose Factors

The MEI is determined using CAP-88 dispersion factors, which are derived for use on the Hanford Site and published in HNF-3602, *Calculating Potential-to-Emit Releases and Doses for FEMPs and NOCs.*

4.0 POTENTIAL EFFECTIVE DOSE EQUIVALENT (PTE) SUMMARY

5.0 EMISSION UNIT DESIGNATION

5.1 241-AY-101 ANNULUS STACK 296-A-18

5.1.1 System Description

The 241-AY Tank Farm, which is located in the 200 East area, northeast of the PUREX facility, received waste from 1968 to 1970. There are a total of two 1,000,000 gallon double-shell tanks in the 241-AY Tank Farm.

The 296-A-18 stack serves the annulus exhaust system for tank 241-AY-101 in the 241-AY Tank Farm. The 241-AY-101 annulus exhaust provides for air flow in the annulus to minimize corrosion of the outer surface of the primary tank, remove heat conducted through the tank wall, and provide emergency ventilation for the tank in the event of failure of primary and backup tank ventilation.

Makeup air is drawn in from the outside, heated and filtered through two HEPA filter banks and then sent through distribution ducts to the top and bottom surfaces of the primary tank. Air slots on the bottom of each tank uniformly distribute the circulating air. Air is removed from the annulus space through a 16-inch diameter duct and through two series HEPA filter trains each containing four filters (2 x2), a single blower system and is vented through the 15-inch diameter 296-A-18 stack.

5.1.2 PTE Source Term Inventory and Assumptions

The primary containment vessel in the 241-AY-101 Tank is intact and is not expected to leak. The design life of this vessel is a minimum of 50 years and the tank has undergone an integrity assessment. If a leak occurs, the annulus source term would be re-evaluated at that time. Therefore, there is no radionuclide source term associated with this stack system.

5.1.3 Calculation of PTE

With no loss of primary containment of the tank the PTE is expected to be 0 mrem/yr.

5.1.4 Tank Farm Stack Designation

Non-designated.

5.2 241-AY-102 ANNULUS STACK 296-A-19

5.2.1 System Description

The 296-A-19 stack serves the annulus exhaust system for tank 241-AY-102, the second double shell tank in the 241-AY Tank Farm. The 241-AY-102 annulus exhaust provides for air flow in the annulus to minimize corrosion of the outer surface of the primary tank, to remove heat conducted through the tank wall, to provide for ventilation of the leak detection pits, and to provide emergency ventilation for the tank in the event of failure of primary and backup tank ventilation.

Makeup air is drawn in from the outside, heated and filtered through a pre-filter and a HEPA filter and then sent through distribution ducts to the top and bottom surfaces of the primary tank. Air slots on the bottom of each tank uniformly distribute the circulating air. Air is removed from the annulus space through a 16-inch diameter duct and through two series HEPA filter trains each containing four filters (2 x 2), a single blower system and is vented through the 15-inch diameter 296-A-19 stack.

5.2.2 PTE Source Term Inventory and Assumptions

The primary containment vessel in the 241-AY-102 Tank is intact and is not expected to leak. The design life of this vessel is a minimum of 50 years and the tank has undergone an integrity assessment. If a leak occurs, the annulus source term would be re-evaluated at that time. Therefore, there is no radionuclide source term associated with this stack system.

5.2.3 Calculation of PTE

With no loss of primary containment of the tank the PTE is expected to be 0 mrem/yr.

5.2.4 Tank Farm Stack Designation

Non-designated.

5.3 241-AZ ANNULUS STACK 296-A-20

5.3.1 System Description

The 241-AZ Tank Farm, which is located in the 200 East area, northeast of the PUREX facility, received waste from 1971 to 1977. There are a total of two 1,000,000 gallon double-shell tanks in the 241-AZ Tank Farm.

The 296-A-20 stack serves the annulus exhaust system for both tanks 241-AZ-101 and 241-AZ-102 in the 241-AZ Tank Farm. The annulus exhaust system provides for air flow in the annuli to minimize corrosion of the outer surface of the primary tanks, remove heat conducted through the tank walls, and provide emergency ventilation for the tanks in the event of failure of primary and backup tank ventilation.

Makeup air is drawn in from the outside, heated and filtered through two HEPA filter banks and then sent through four separate distribution ducts to the top and bottom surfaces of each of the primary tanks. Air is removed from the annulus space through a 16-inch diameter duct and through separate HEPA filter banks, one for each tank, and exhausted through the 24-inch diameter 296-A-20 stack.

5.3.2 PTE Source Term Inventory and Assumptions

The primary containment vessels in the 241-AZ Tank Farm are intact and are not expected to leak. The design life of these vessels is a minimum of 50 years and the tanks have undergone integrity assessments. If a leak occurs, the annulus source term would be re-evaluated at that time. Therefore, there is no radionuclide source term associated with this stack system.

5.3.3 Calculation of PTE

With no loss of primary containment of the tank the PTE is expected to be 0 mrem/yr.

5.3.4 Tank Farm Stack Designation

Non-designated.

5.4 241-AZ 702, AY AND AZ TANK EXHAUST STACK 296-A-42

5.4.1 System Description

The 296-A-42 stack is the primary ventilation system stack for tanks in the 241-AY and 241-AZ Tank Farms. This system is described in the letter 94-RPS-149, J. D. Bauer, RL, to A. W. Conklin, WDOH, "Application for Approval for Construction Pursuant to 40 Code of Federal Regulations 61 for Ventilation Upgrades, 241-AY and 241-AZ Tank Farms," dated March 2, 1994.

5.4.2 PTE Source Term Inventory and Assumptions

Estimates of potential emissions from 702-AZ were derived in support of DOE/RL-98-27, Rev 0, *Radioactive Air Emissions Notice of Construction for Ventilation Upgrades for 241-AY and 241-AZ Tank Farms*, published April 1998. With limited information available, potential emissions were very conservatively estimated at 550 mrem/yr to the maximally exposed individual (MEI). At the time, the location of the MEI was in Ringold.

Since that time new data has become available, allowing for a more accurate estimate. Potential emissions were again estimated in Radioactive Air Emissions Notice of Construction Application for Installation and Operations of a Waste Retrieval System in Tanks 241-AZ-101, 241-AZ-102, 241-AY-101, and 241-AY-102. This document serves as a notice of construction (NOC) for the installation and operation of waste retrieval systems (including mixer pumps) in each of tanks 241-AZ-101, 241-AZ-102, 241-AY-101 and 241-AY-102. Data from the Tank Waste Information Network System (TWINS) data base, Best Basis Inventory, Best Basis Summary was used along with the method specified in 40 CFR 61, Appendix D. All radionuclides except H-3 and C-14 were treated as particulates with release factors of 1E-03. H-3 and C-14 were treated as gaseous with release factors of 1.0E+00.

This PTE determination evaluated radiological vapor sample data acquired from the head space of tank 241-AZ-101. Sample data was taken prior to mixer pump operation as well as during mixer pump operation. This data was adjusted to account for 2450 hours of mixer pump operation per year in tank 241-AZ-101 and 450 hours of mixer pump operation per year in each of tanks 241-AY-101, 241-AY-102, and 241-AZ-102. An estimate for emissions without mixer pump operation as well as with mixer pump operation was determined. The result of the evaluation for the maximum permitted number of hours the pumps are allowed to operate in a year was 1.6 mrem/yr to the onsite individual. The result when the mixer pumps were not operating was 0.11 mrem/yr.

5.4.3 Calculation of PTE

Once operational, emissions during use of the mixer pump from the AZ tanks were estimated to be 2.35E+03 mrem. Emissions during use of the mixer pump from the AY tanks were estimated to be 1.21E+03 mrem. The total emissions from the 702AZ emission point, then were estimated to be 3.57E+03 mrem. This potential dose was to the off-site receptor, again in Ringold.

For purposes of the updated estimate in this document, data from the Tank Waste Information Network System (TWINS) data base, Best Basis Inventory, Best Basis Summary as of March of 2006 was used. The total emissions from the 702AZ emission point, using this source term was 4.98E+03 mrem. This potential dose was to the off-site receptor - Ringold.

Lastly, since these above estimates were made using very conservative methods a more accurate estimate was documented in CH2M-20195, Revision 1, *702-AZ Potential Impact Category*, September 2004. The purpose of this was to classify this emission point in terms of the Potential Impact Category (PIC) defined in 2 of ANSI/HPS N13.1-1999, *Sampling and Monitoring Releases of Airborne Radioactive Substances from Stacks and Ducts of Nuclear Facilities.* ANSI/HPS N13.1-1999 establishes PIC designations in terms of a potential fraction of an allowable limit. In addition, for comparison purposes, emissions were estimated using a HEPA filter disposal assay. The result was 0.024 mrem/yr.

These results indicate that the 702-AZ stack 296-A-42 should appropriately be classed as a PIC 2 Category source. The calculations can be found in Appendix A.

5.4.3 Tank Farm Stack Designation

Designated.

5.5 241-AZ 702 BUILDING EXHAUST STACK 296-A-43

5.5.1 System Description

The 296-A-43 stack ventilates the 702-AZ building which houses the 296-A-42 stack vent system discussed above.

5.5.2 PTE Source Term Inventory and Assumptions

No radionuclide source term currently exists within it.

5.5.3 Calculation of PTE

As no source exists with this facility, potential emission for this facility is estimated to be 0 mrem/yr.

5.5.4 Tank Farm Stack Designation

Non-designated.

5.6 242-A EVAPORATOR BUILDING STACK 296-A-21

5.6.1 System Description

The 296-A-21 stack system ventilates the 242-A Evaporator building, providing a negative pressure with respect to external areas for the containment of radioactive materials which may escape the primary evaporator vessel containment. The 242-A Evaporator is located to the east of the PUREX facility in the 200 East area.

The 242-A Evaporator is used to remove water from the non-boiling, high-level liquid waste primarily from adjacent tank farms, principally the 241-AW Tank Farm. With the water evaporated, concentrated waste is returned to double-shell tanks in the 200 East area.

The ventilation system for the 242-A Evaporator building provides containment for certain radiologically controlled areas within the facility. The Inlet air passes through pre-heater, pre-filter, heater, water scrubber, and blower systems. The inlet air is then split into four air trains, passing through additional heaters and ventilating the evaporator room, pump room, condenser room, loadout/hot storage areas and loading dock areas. Exhaust air passes from these areas through two parallel systems consisting of pre-filter, two HEPA filters, and blower before being exhausted through the 42-inch diameter 296-A-21 stack.

5.6.2 PTE Source Term Inventory and Assumptions

The inventory is based on maximum contamination levels in high contamination areas, contamination areas and buffer areas at the 242-A Evaporator. The maximum contamination in the Pump Room and Evaporator Room is 1,000,000 dpm/cm2 beta/gamma, and 2,000 dpm/100cm2 alpha. The room dimensions (length, width, height) were used to estimate surface area, then doubled to allow for piping and equipment. Total alpha was conservatively assumed to be Am-241 and total beta/gamma was conservatively assumed to be Sr-90.

5.6.3 Calculation of PTE

Applying Appendix D methods and CAP88-PC dispersion factors to the calculated source term in 1998 the TEDE to the on-site MEI was 6.60E-06 mrem/yr. Adjusting for changes in 2002 to the CAP88-PC dispersion factors, results in a current TEDE to the MEI of 1.43E-03 mrem/yr. These calculations can be seen in Appendix B.

5.6.4 Tank Farm Stack Designation

Non-designated.

5.7 242-A EVAPORATOR VESSEL VENT STACK 296-A-22

5.7.1 System Description

The 296-A-22 stack system ventilates the 242-A Evaporator vessel and associated equipment, providing containment and moisture removal for the system. The 242-A Evaporator is located to the east of the PUREX facility in the 200 East area.

The 242-A Evaporator is used to remove water from the non-boiling, high-level liquid waste primarily from adjacent tank farms, principally the 241-AW Tank Farm. With the water evaporated, concentrated waste is returned to double-shell tanks in the 200 East area.

Vessels which are evacuated via the 296-A-22 stack include the 242-A vacuum condenser, process condensate tank, after-condenser drain, and condensate collection vessel. Inlet air is bled from the Evaporator building air system and is passed through a HEPA filtration system. Vapor extracted from these systems passes through a deentrainer system, a pre-filter/demister system, heater, and two HEPA filters before being exhausted through the 296-A-22 stack.

5.7.2 PTE Source Term Inventory and Assumptions

The maximum concentrations allowed for the slurry concentrate are based on SAR limits. The SAR limits are the maximum concentrations allowed for the slurry concentrate. A maximum of three passes for the feed stream would result in a waste reduction factor of 87%. The PTE calculations were performed presuming the curies present in the feed would challenge the primary HEPA filter up to three times. The maximum operating time is 182 days/year with a maximum sustained feed rate is 90 gal.min.

5.7.3 Calculation of PTE

In a letter to Messrs. Leitch of EPA and Conklin of WDOH in March of 1998, *National Emission Standards for Hazardous Air Pollutants Federal Facility Compliance Agreement: Request for Redesignation of the 296-A-22 Stack*, the PTE was demonstrated to be approximately 3.2E-06 mrem/yr. An NDA was performed and applied to the SAR driven concentration limits identified in 5.7.2. A release factor of 1.45E-12 was approved for this unique emission unit based on the curies accumulated on the primary HEPA filter divided by the curies processed. CAP88-PC dispersion factors were applied to achieve the final result.

The values calculated in 1998 have been recalculated in this document to reflect CAP88-PC dispersion factors modified in 2002. The adjusted potential TEDE to the MEI resulted in 2.16E-05 mrem/yr. These calculations can be seen in Appendix C.

Note: Although this stack is non-designated, it is treated as a designated stack during evaporator campaigns.

5.7.4 Tank Farm Stack Designation

Non-designated.

5.8 204-AR UNLOADING FACILITY STACK 296-A-26

5.8.1 System Description

The 296-A-26 stack system ventilates the 204-AR Unloading Facility, providing negative pressure in the unloading area and soiled clothes area. The 204-AR Unloading Facility is located north of the PUREX Plant in the 200 East area.

The 204-AR Unloading Facility is designed to unload liquid radioactive materials from railroad tank cars and trucks in a radiologically controlled area. Railroad tracks enter the Facility from the west and extend to the length of the unloading area. The unloading area has dimensions of 25 feet high x 65 feet long x 40 feet wide. Radioactive liquid wastes are primarily non-complexed and phosphate wastes from T-Plant, 300 and 400 Area operations, from the 222-S lab, and from the N-Reactor.

The unloading area and adjacent soiled clothes area are vented through a single deentrainer, prefilter and two series HEPA filters, and a single blower system. Liquid waste is removed from railroad tank cars and trucks under negative pressure with a closed piping system, so isolation from areas ventilated by the 296-A-26 stack system is maintained.

5.8.2 PTE Source Term Inventory and Assumptions

Radionuclide inventory is based on beta/gamma levels found in survey data taken on 11/30/89 and reported on 11/01/94. This data can be found in Internal Memo 33680-95-047 from Radiological Engineering and ALARA, subject "CCIP Database Update for Second Quarter 1995", dated June 5, 1995. This data shows loose surface beta/gamma contamination at 5,000 disintegrations per minute per 100 square centimeters. Assuming as a worse case scenario that Sr-90 is representative of beta, with the contamination assumed to be uniformly distributed over all ventilated surface areas, (1E+07 square centimeters), the total curie content available for release from this stack would be 2.5E-04 curies.

5.8.3 Calculation of PTE

The highest CAP-88 mrem to curie factor for the onsite receptor is 1.10E-01. Using this factor, the PTE for this emission point would be 2.5E-04 curies times 1.1E-01 mrem/curie which equals 2.8E-05 mrem/yr.

5.8.4 Tank Farm Stack Designation

Non-designated.

5.9 241-AW TANK FARM PRIMARY TANK VENTILATION STACK 296-A-27

5.9.1 System Description

The 241-AW Tank Farm is located northeast of the PUREX plant in the 200 East area. A total of six double shell tanks in the 241-AW Tank Farm, each with a volume of 1,200,000 gallons, received waste primarily from the PUREX waste stream. This Farm was first used to contain waste in 1978.

The 296-A-27 stack system ventilates the 241-AW Farm tanks, providing negative pressure and removal of heat and vapor from the primary containment vessels.

The primary ventilation system consists of a deentrainer system for removal of moisture from vented air, an electric heater for lowering the relative humidity of the vented air, a pre-filter system for reducing the number of large particles which load the filter system, and a two-stage HEPA filter system. The primary exhaust system has an automatic switchover to a backup system in the event of failure of the primary system. Each 241-AW tank is exhausted through independent 12-inch diameter steel ducts which run to the central exhaust station and ultimately through the 10-inch diameter 296-A-27 stack.

5.9.2 PTE Source Term Inventory and Assumptions

The majority of the source term inventory was obtained from 2001 TWINS data and adjusted in accordance with a nondestructive assay performed on September 27, 2001. By request of WDOH, a sample of condensate from the housing of the 241-SY Farm exhauster was analyzed in order to account for additional inventory that may be present in the condensate formed within the 241-AW exhauster filter housing. The results were added to the adjusted TWINS data. The total represented the Annual Possession Quantity (APQ) and was used to estimate emissions cited in external letter 02-EMD-024, J. E. Rasmussen, ORP, to A. W. Conklin, WDOH, "Non-Destructive Analysis Results for the 241-AN, 241-AP, and 241-AW Tank Farms," dated March 5, 2002.

5.9.3 Calculation of PTE

The nondestructive assay, performed in 2001, resulted in a total of 4.0E-02 curies of Cs-137 on all the filters (one pre-filter and two HEPA filters on both the upper and lower filter trains). The maximum value for each radionuclide in the AW Tank Farm source term was then obtained from a 2001 TWINS query. A ratio was determined for the Cs-137 found on the filters to the maximum Cs-137 value found in all the AW tanks. This ratio was then multiplied by the rest of the maximum TWINS radionuclide values found in the AW tanks. The individual radionuclide results from this calculation were added to the previously determined condensate data. This APQ was multiplied by both the off site CAP-88 dose factors and the onsite dose factors. The off site total and on site total were compared. The largest of these sums indicated a PTE of 2.74E-02 mrem/yr.

Applying current CAP-88 values to this original APQ yields 2.74E-02 mrem/yr to the onsite individual. The condensate results are contained in Appendix D. The AW results are contained in Appendix E.

5.9.4 Tank Farm Stack Designation

Non-designated.

5.10 241-AW TANK FARM PRIMARY TANK EXHAUST STACK A 296-A-46 AND 296-A-47

5.10.1 System Description

Two ventilation stack systems, 296-A-46 and 296-A-47, were constructed to replace the existing AW exhaust train. These ventilation systems consist of two parallel exhaust trains. Each individual train is capable of providing up to at least 2,000 standard CFM of exhaust flow. In addition, these systems are designed for both trains to operate either one at a time or together for a combined total flow rate of up to 4,000 standard CFM. Operation of these ventilation systems will be for the storage, treatment, retrieval, and disposal of the waste contained within the tanks. This includes transfer of waste to the Waste Treatment and Immobilization Plant (WTP).

5.10.2 PTE Source Term Inventory and Assumptions

The PTE Source Term for this system was estimated in the Radioactive Air Emissions Notice of Construction, Project W-314 – Operation of New Ventilation Systems in AN and AW Tank Farms. The inventory used was derived from the TWINS data base, as of September 9, 2003. Radionuclides from all 177 single shell tanks (SSTs) and DSTs in the tank farm complex were sorted from highest to lowest. To account for all six tanks in the AW Tank Farm, the six highest quantities for each individual radionuclide was selected. These quantities were totaled to arrive at an AW Farm APQ.

5.10.3 Calculation of PTE

Emission estimates from the new AW exhausters are presented in Appendix F. Emissions were estimated using the most conservative release fraction values (8.0×10^{-5}) cited in PNNL-14467, *Preliminary Synopsis of Release Fraction Tests*, Judith Bamberger and John Glissmeyer. Unabated emissions were determined by applying this release fraction directly to the APQ values obtained from the source term analysis described in section 5.8.2 above – except for tritium and Carbon 14. For these two radionuclides, a release fraction of one was used since they could take the form of a gas. The PTE estimate for these exhausters resulted in approximately 640 mrem/yr to the off site individual.

5.10.4 Tank Farm Stack Designation

Designated.

5.11 241-AW TANK FARM ANNULUS EXHAUST STACK 296-A-28

5.11.1 System Description

The 296-A-28 stack system ventilates the annuli of all six of the 241-AW Farm tanks, providing removal of heat from the outer surface of the primary tanks, and maintenance of a dry environment to minimize corrosion of the primary tank.

The 241-AW tank annuli ventilation system contains an intake stack with prefilter, HEPA filter and manually operated butterfly valve for adjusting inlet air distribution over primary tank surfaces; and exhaust system consisting of dual deentrainer, heater, HEPA filter and blower systems. The annulus exhaust system for each of the tanks consists of four independent 8-inch diameter risers which merge into one 12-inch diameter duct. This exhausts through the 16-inch diameter 296-A-28 stack.

5.11.2 PTE Source Term Inventory and Assumptions

The primary containment vessels in the 241-AW Tank Farm Are intact and are not expected to leak. The design life of these vessels is a minimum of 50 years and the tanks have undergone integrity assessments. If a leak occurs, the annulus source term would be re-evaluated at that time. Therefore, there is no radionuclide source term associated with this stack system.

5.11.3 Calculation of PTE

With no loss of primary containment of the tank the PTE is expected to be 0 mrem/yr.

5.11.4 Tank Farm Stack Designation

Non-designated.

5.12 241-AN TANK FARM PRIMARY TANK EXHAUST STACK 296-A-29

5.12.1 System Description

The 241-AN Tank Farm, located near the intersection of Canton Avenue and 7th Street in the 200 East area, was first used to contain waste in 1980. The seven tanks in the 241-AN Tank Farm, each of which has a 1,200,000 gallon capacity, are double-shelled with continuous monitoring and ventilation of primary tank and annuli.

The 296-A-29 stack system ventilates the 241-AN Farm tanks, providing negative pressure and removal of heat and vapor from the primary containment vessels. The primary ventilation system consists of a deentrainer system for removal of moisture from vented air, an electric heater for lowering the relative humidity of the vented air, a pre-filter system for reducing the number of large particles which load the filter system, and a two-stage HEPA filter system. The primary exhaust system has an automatic switchover to a backup system in the event of failure of the primary system. Each 241-AN tank is exhausted through independent 12-inch diameter steel ducts which travel underground to the central exhaust station and out through the 10-inch diameter 296-A-29 stack.

5.12.2 PTE Source Term Inventory and Assumptions

The majority of the source term inventory was obtained from 2001 TWINS data adjusted in accordance with a nondestructive assay performed on May 1, 2001. By request of WDOH, a sample of condensate from the housing of the 241-SY Farm exhauster was analyzed in order to account for additional inventory that may be present in the condensate formed within the 241-AN exhauster filter housing. The results were added to the adjusted TWINS data. The total represented the Annual Possession Quantity (APQ) and was used to estimate emissions cited in external letter 02-EMD-024, J. E. Rasmussen, ORP, to A. W. Conklin, WDOH, "Non-Destructive Analysis Results for the 241-AN, 241-AP, and 241-AW Tank Farms," dated March 5, 2002.

5.12.3 Calculation of PTE

The nondestructive assay, performed in 2001, resulted in a total of 3.1E-03 curies of Cs-137 on all the filters (one pre-filter and two HEPA filters on both the upper and lower filter trains). The maximum value for each radionuclide in the AN Tank Farm source term was then obtained from a 2001 TWINS query. A ratio was determined for the Cs-137 found on the filters to the maximum Cs-137 value found in all the AN tanks. This ratio was then multiplied by the rest of the maximum TWINS radionuclide values found in the AN tanks. The individual radionuclide results from this calculation were added to the previously determined condensate data. This APQ was multiplied by both the off site CAP-88 dose factors and the on site dose factors. The off site total and on site total were compared. The largest of these sums indicated a PTE of 1.69E-02 mrem/yr.

Applying current CAP-88 values to the APQ cited above also results in 1.7E-02 mrem/yr to the on site individual. The condensate results are contained in Appendix C. The AN results are contained in Appendix G.

5.12.4 Tank Farm Stack Designation

Non-designated.

5.13 241-AN TANK FARM PRIMARY TANK EXHAUST STACK A 296-A-44 AND 296-A-45

5.13.1 System Description

Two ventilation stack systems, 296-A-44 and 296-A-45, were constructed to replace the existing AN exhaust train. These ventilation systems consist of two parallel exhaust trains. Each individual train is capable of providing up to at least 2,000 standard CFM of exhaust flow. In addition, these systems are designed for both trains to operate either one at a time or together for a combined total flow rate of up to 4,000 standard CFM. Operation of these ventilation systems will be for the storage, treatment, retrieval, and disposal of the waste contained within the tanks. This includes transfer of waste to the Waste Treatment and Immobilization Plant (WTP).

5.13.2 PTE Source Term Inventory and Assumptions

The PTE Source Term for this system was estimated in the Radioactive Air Emissions Notice of Construction, Project W-314 – Operation of New Ventilation Systems in AN and AW Tank Farms. The inventory used was derived from the TWINS data base, as of September 9, 2003. Radionuclides from all 177 single shell tanks (SSTs) and DSTs in the tank farm complex were sorted from highest to lowest. To account for all seven tanks in the AN Tank Farm, the seven highest quantities for each individual radionuclide was selected. These quantities were totaled to arrive at an AN Farm APQ.

5.13.3 Calculation of PTE

Emission estimates from the new AN exhausters are presented in Appendix H. Emissions were estimated using the most conservative release fraction values ($8.0x10^{-5}$) cited in PNNL-14467, *Preliminary Synopsis of Release Fraction Tests*, Judith Bamberger and John Glissmeyer. Unabated emissions were determined by applying this release fraction directly to the APQ values obtained from the source term analysis described in section 5.13.2 above – except for tritium and Carbon 14. For these two radionuclides, a release fraction of one was used since they could take the form of a gas. The PTE estimate for these exhausters resulted in approximately 690 mrem/yr to the off site individual.

5.13.4 Tank Farm Stack Designation

Designated.

5.14 241-AN TANK FARM ANNULUS EXHAUST STACK 296-A-30

5.14.1 System Description

The 296-A-30 stack system ventilates the annuli of the 241-AN Farm tanks, providing removal of heat from the outer surface of the primary tanks, and maintenance of a dry environment to minimize corrosion of the primary tank. The 241-AN Tank Farm is located near the intersection of Canton Avenue and 7th Street in the 200 East area.

The 241-AN tank annuli ventilation system contains an intake stack with prefilter, HEPA filter and manually operated butterfly valve for adjusting inlet air distribution over primary tank surfaces; and exhaust system consisting of parallel deentrainer, heater, HEPA filter and blower systems. The annulus exhaust system for each of the tanks consists of four 8-inch diameter risers. Tanks 241-AN-101, 241-AN-102, and 241-AN-103 exhaust risers are combined into one of the two parallel exhaust systems (designated K2-1) while tanks 241-AN-104, 241-AN-105, 241-AN-106, and 241-AN-107 are combined into the second of the two parallel exhaust systems (designated K2-2). These systems are each exhausted at the 296-A-30 stack.

5.14.2 PTE Source Term Inventory and Assumptions

The primary containment vessels in the 241-AN Tank Farm Are intact and are not expected to leak. The design life of these vessels is a minimum of 50 years and the tanks have undergone integrity assessments. If a leak occurs, the annulus source term would be re-evaluated at that time. Therefore, there is no radionuclide source term associated with this stack system.

5.14.3 Calculation of PTE

With no loss of primary containment of the tank the PTE is expected to be 0 mrem/yr.

5.14.4 Tank Farm Stack Designation

Non-designated.

5.15 241-AP TANK FARM PRIMARY TANK EXHAUST STACK 296-A-40

5.15.1 System Description

The 296-A-40 stack system ventilates the 241-AP Double Shell Tank Farm tanks, providing negative pressure and removal of heat and vapor. The 241-AP Tank Farm is located northeast of the PUREX Plant. The AP Tank Farm became operational in October of 1986 (reference the Double Shell Tank Farm Dangerous Waste Permit Application, DOE/RL 90-39, Table 4-2). The tanks received waste from single-shell tanks, from the PUREX waste stream and the 242-A Evaporator via Valve Pits 241-A. There are a total of eight tanks in the Tank Farm, each with a volume of 1,200,000 gallons each.

Each 241-AP tank is exhausted through independent 12-inch diameter steel ducts which combine into a common 12-inch diameter duct. This duct passes underground to the central ventilation station located on the east side of the 241-AP Tank Farm. The ventilation system consists of two exhaust trains referred to as the K1-1 and K1-2 subsystems. Either subsystem can ventilate all eight primary tanks at a pressure of -0.25 to -5.0 in. WG (vacuum), at a maximum flow rate of approximately 1100 scfm. Only one subsystem operates at any given time, the other system acting as the backup. The system is designed to automatically switch over to the other subsystem in the event of failure of the one running.

Each subsystem consists of a deentrainer system for removal of moisture from vented air, an electric heater for lowering the relative humidity of the vented air, a pre-filter system for reducing the number of large particles which load the filter system, and a two-stage HEPA filter system. Either subsystem deentrainer may be used with either HEPA filter subsystem via a ventilation duct cross-tie.

The K1-1 subsystem consists of the K1-1-1 deentrainer (located within the south side of the two adjoining deentrainer vaults), the lower filter housing assembly from valves MK-1603 to MK-107 and the K1-5-1 exhaust fan which discharges to the 10-in. diameter K1 exhaust stack. The lower filter housing consists of a prefilter and two HEPA filters which are labeled as K1-3-2, K1-4-3 and K1-4-4 (see illustration below).

The K1-2 subsystem is a duplicate of K1-1, utilizing the (northern) K1-1-2 deentrainer, upper filter housing assembly from valves MK-1604 to MK-1608 and the K1-5-2 exhaust fan which also discharges out the K1 stack. The upper filter housing consists of a prefilter and two HEPA filters which are labeled as K1-3-1, K1-4-1 and K1-4-2.

The deentrainer vaults, filter housings and related piping are enclosed within an 8-ft high shielding wall on the Central Exhaust Station pad. The system fans and the K1 stack are located outside the east wall of the enclosed area.

5.15.2 PTE Source Term Inventory and Assumptions

The majority of the source term inventory was obtained from 2001 TWINS data adjusted in accordance with a nondestructive assay performed on September 27, 2001. By request of WDOH, a sample of condensate from the housing of the 241-SY Farm exhauster was analyzed in order to account for additional inventory that may be present in the condensate formed within the 241-AP exhauster filter housing. The results were added to the adjusted TWINS data. The total represented the Annual Possession Quantity (APQ) and was used to estimate emissions cited in external letter 02-EMD-024, J. E. Rasmussen, ORP, to A. W. Conklin, WDOH, "Non-Destructive Analysis Results for the 241-AN, 241-AP, and 241-AW Tank Farms," dated March 5, 2002.

5.15.3 Calculation of PTE

The nondestructive assay performed, in 2001 resulted in a total of 9.1E-03 curies of Cs-137 on all the filters (one pre-filter and two HEPA filters on both the upper and lower filter trains). The maximum value for each radionuclide in the AP Tank Farm source term was then obtained from a 2001 TWINS query. A ratio was determined for the Cs-137 found on the filters to the maximum Cs-137 value found in all the AP tanks. This ratio was then multiplied by the rest of the maximum TWINS radionuclide values found in the AP tanks. The individual radionuclide results from this calculation were added to the previously determined condensate data. This APQ was multiplied by both the off site CAP-88 dose factors and the on site dose factors. The off site total and on site total were compared. The largest of these sums indicated a PTE of 1.9E-02 mrem/yr.

The PTE result cited in the letter was 1.9E-02 mrem/yr. The result using current CAP-88 values is 1.84E-02 mrem/yr to the on site individual. The condensate results are contained in Appendix C. The AP results are contained in Appendix I.

5.15.4 Tank Farm Stack Designation

Non-designated.

5.16 241-AP TANK FARM ANNULUS EXHAUST STACK 296-A-41

5.16.1 System Description

The 296-A-41 stack system ventilates the annuli of the 241-AP Farm tanks, providing removal of heat from the outer surface of the primary tanks, and maintenance of a dry environment to minimize corrosion of the primary tank. The 241-AP Tank Farm is located northeast of the PUREX Plant.

The 241-AP tank annuli ventilation system contains four independent air intake stations with heaters, pre-filters and HEPA filter systems. Each of the stations feeds two of the AP tanks. The exhaust portion of the ventilation system consists of one 8-inch diameter riser for each tank. Four of the risers are combined into a common 12-inch diameter duct in two valve pit systems. These two 12-inch diameter ducts are combined into a common 24-inch diameter duct which feeds parallel heater, HEPA filter assemblies in series, and blower systems.

5.16.2 PTE Source Term Inventory and Assumptions

The primary containment vessels in the 241-AP Tank Farm Are intact and are not expected to leak. The design life of these vessels is a minimum of 50 years and the tanks have undergone integrity assessments. If a leak occurs, the annulus source term would be re-evaluated at that time. Therefore, there is no radionuclide source term associated with this stack system.

5.16.3 Calculation of PTE

With no loss of primary containment of the tank the PTE is expected to be 0 mrem/yr.

5.16.4 Tank Farm Stack Designation

Non-designated.

5.17 241-SY TANK FARM ANNULUS EXHAUST STACK 296-P-22

5.17.1 System Description

The 296-P-22 stack system ventilates the annuli of the 241-SY Farm tanks, providing removal of heat from the outer surface of the primary tanks, and maintenance of a dry environment to minimize corrosion of the primary tank. The 241-SY Tank Farm is located south of the Plutonium Finishing Plant in the 200 West area.

Tanks in the 241-SY Tank Farm are double-shell tanks, first used to contain waste in 1974. There are a total of three tanks in the Tank Farm, each with a volume of 1.2 M gallons. The 241-SY tank annuli ventilation system contains an inlet system consisting of four inlet ducts per tank originating from parallel banks of pre-filter and HEPA filter systems and an outlet system consisting of deentrainer, heater, pre-filter and HEPA filter. The 296-P-22 annuli exhaust system does not have a backup system as do other double-shell tank farms. Portable exhauster units may be used for this purpose.

5.17.2 PTE Source Term Inventory and Assumptions

The primary containment vessels in the 241-SY Tank Farm Are intact and are not expected to leak. The design life of these vessels is a minimum of 50 years and the tanks have undergone integrity assessments. If a leak occurs, the annulus source term would be re-evaluated at that time. Therefore, there is no radionuclide source term associated with this stack system.

5.17.3 Calculation of PTE

With no loss of primary containment of the tank the PTE is expected to be 0 mrem/yr.

5.17.4 Tank Farm Stack Designation

Non-designated.

5.18 241-SY TANK FARM PRIMARY EXHAUST STACKS 296-S-25 AND 296-P-23

5.18.1 System Description

The 296-S-25 and 296-P-23 stack systems ventilate the 241-SY Farm tanks, providing negative pressure and removal of heat and vapor from the primary containment vessels. The 241-SY Tank Farm is located south of the Plutonium Finishing Plant in the 200 West area.

Tanks in the 241-SY Tank Farm are doubled shelled tanks, first used to contain waste in 1974. There are a total of three tanks in the Tank Farm, each with a volume of 1,200,000 gallons.

The primary ventilation system connects to the tanks through 12-inch diameter risers which run independently to the exhaust system. There are two exhausters used as this ventilation system. Both exhausters are 1000 CFM exhausters which consist of a heater, a prefilter, two HEPA filters and one blower system. The A-Train exhauster is stack 296-S-25. The B-Train exhauster is stack 296-P-23.

5.18.2 PTE Source Term Inventory and Assumptions

A commitment was made to WDOH[1] to perform a non-destructive analysis (NDA) on the 241-SY exhauster (currently referred to as the A-Train stack number 296-S-25) filters and moisture

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[1] W. J. Pasiak, ORP, to A. W. Conklin, WDOH, "Response to the Washington State Department of Health (WDOH Request for the Scheduling for Upgrading Double-Shell Tank (DST) Farms 241-SY, 241-AN, 241-AP, and 241-AW Exhausters," 01-EQD-048/0103229, dated June 6, 2001.

removal components after six months of operation. In addition, it was agreed that the data from this NDA would be combined with the analytical results from the condensate sample obtained from the original 296-P-23 ductwork to calculate a potential-to-emit (PTE) so the status (major/minor) of the exhauster could be confirmed.

Combining the NDA results with radiological analytical results of any condensate collected from the filter housing provides a fairly complete assessment of potential emissions which might occur without the benefit of abatement technology. Condensate was able to be collected from the original 296-P-23 because, at that time, the drain line was partially plugged so condensate could not drain back to the tank. The analytical results of condensate taken from the original 296-P-23 were transmitted to WDOH in July of 2001.

The NDA was performed on the exhauster components (demister, pre-filter, and both HEPA filters) on August 22, 2002[2]. Since the NDA only represented a portion of a years operation, the total operating time for this exhauster prior to the NDA, was obtained from documented log entries and determined to be 4,817 hours. This operational time represents 55 percent of a year, or slightly over six months.

5.18.3 Calculation of PTE

The NDA report indicated that 0.0851 curies had accumulated on the demister, pre-filter, and both HEPA filters of the 296-S-25 exhauster. The NDA report also indicated that Cs-137 was the only observed gamma-ray emitting radionuclide. Gamma rays are the only ionizing radiation that can penetrate the exhauster housing and be measured by the NDA instrumentation. Therefore, to identify the possible non-gamma emitting radionuclide inventory that may also reside on the measured exhauster components, the following technique was used:

- The total radionuclide inventory in all three SY Tanks was downloaded from TWINS3 on 7/24/02. Using this inventory, the quantities of each individual radionuclide from all three SY tanks were added together creating individual radionuclide inventories for the entire SY farm. A ratio was next determined by dividing each of these radionuclide inventories by the total inventory determined for Cs-137. This ratio, for each radionuclide, was then multiplied by the Cs-137 quantity determined by NDA to be on the exhauster components. This result provides an appropriate radionuclide inventory fitted to the exhauster. This inventory fitting was multiplied by the 200 West Area CAP-88 Factors published in HNF-3602, Revision 1, for both the on site and off site MPR. This result indicates the on site MPR would receive the higher dose. The data and calculations are provided in Appendix SY.

  An operating time for this exhauster was obtained from the TMACS Exhauster Log TO-040-035, Operate Tank Monitor and Control System (TMACS) Surveillance System for Underground Storage Tanks. The operating time of the 296-S-25 exhauster up to the

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[2] J. J. Dorian, Duratek, to K. J. Anderson, CH2M HILL Hanford Group, Inc, "Non-Destructive Assessment of Gamma Radiation Activity from 241-SY Tank Farm Ventilation System Primary and Secondary HEPA Filters, Fiscal Year 2002," JJD-02-2371, dated September 26, 2002.

NDA (8/22/2002) totaled 4817 hours. The fraction of a year that this represents is 0.55. This data is given in Table 2.

The On site MEI result was divided by the fraction of a year that the exhauster operated in order to extrapolate the emission estimate to an annual value. Finally, the analytical data results from the water sample obtained from the original 296-P-23 ductwork, was added to the extrapolated annual emission estimate. The water sample data is shown in Appendix C. The final result was 9.64E-02 mrem/yr to the on site individual. The calculations are presented in Appendix J.

5.18.4 Tank Farm Stack Designation

Non-designated.

5.19 241-SX TANK FARM TANK EXHAUST STACK 296-S-15

5.19.1 System Description

The 241-SX Tank Farm is located south of the Plutonium Finishing Plant in the 200 West Area. The 241-SX tanks are 1,000,000 gallon capacity single-shell tanks, first used to contain waste in 1953. They were removed from service ranging from 1958 for tank SX113 to 1980 for tanks SX101 thru 106. Each of the tanks had HEPA filters installed on their inlets as follows:

Tanks 241-SX-101 thru 241-SX-106 had inlet HEPA filters installed on 10/25/85.

Tanks 241-SX-107 thru 241-SX-112 and tank 241-SX-114 had older model HEPAs installed in the early 1970s. These older model HEPAs were replaced with newer model HEPAs in the 1987 time frame.

Tanks 241-SX-113 and 241-SX-115 had inlet HEPAs installed on 7/8/82.

All of the SX Tank Farm Tanks, except 113 and 115, are currently vented through the SX Tank Farm Exhauster (296-S-15), thereby providing negative pressure and removal of heat and vapor from these tanks. Because Tanks SX-113 and SX-115 are not vented through this exhauster, the inlet HEPAs for these tanks are more appropriately referred to as breather filters. Tanks 241-SX-101 thru 241-SX-106 are vented thru tank 241-SX-109 before being exhausted from the 296-S-15 stack.

Tanks 241-SX-107, 241-SX-108, 241-SX-109, 241-SX-110, 241-SX-111, 241-SX-112, and 241-SX-114 all are connected to the SX Tank Farm exhauster via separate vent headers. The SX Tank Farm Exhauster consists of a single heater, a parallel set of prefilters and two HEPAs in series, two fans, and a 15 foot high, 42 inch diameter stack. The stack is as wide as it is because this exhauster was originally designed to operate both of its 11,350 CFM capacity fans simultaneously to produce a total flow of 22,650 CFM out the stack. Later, the fans were downgraded to a maximum capacity of 6100 CFM and the design was changed to allow for their independent operation. Vent & balance flow rate measurement data taken from this stack from 09/18/90 to 04/02/96 averaged 3,785 CFM with a standard deviation of 1002 CFM.

5.19.2 PTE Source Term Inventory and Assumptions

A PTE assessment was documented in Ltr 9301990B R60 from W. T. Dixon, WHC, to J. E. Rasmussen, RL, subject "National Emission Standards for Hazardous Air Pollutants Federal Facility Compliance Agreement: Reassessment of Potential Radionuclide Emissions from the 296-S-15 Stack," dated August 27, 1996. This assessment was via Non-Destructive Assay (NDA) or In-Situ Gamma Spectroscopy of the HEPA filters. The results reported in the letter quoted a total curie content on the filters at the facility of 1.96E-02 curies (Ci) of Cs-137. However, a subsequent correction to this value yielded a final result of 8.7E-02 curies of Cs-137.

Although the HEPAs were in place for 14 years, a conservative life of 5 years was used in the potential emission determination. Although the annual emissions reported in the letter appeared to be 3.8E-03 curies, with the corrections made, the annual emissions source term, (Cs-137 on the filters) from this facility was determined to be 8.7E-02 Ci/5 = 1.7E-02 Ci.

This value was applied to the SX Tank Farm source term available at the time. Extrapolating from the 1.7E-02 curie result, a ratio was determined for the sum of Cs-137 found on the SX filters to the sum of Cs-137 found in the samples of the source term.

Since the time of the original designation determination, additional source term information has become available and published in the TWINS database. Applying the NDA result of 1.7E-02 curies to the data found in a TWINS query, a ratio was determined for the sum of Cs-137 found on the SX filters to the sum of Cs-137 found in all the SX Tank Farm tanks. This ratio was then multiplied by all the rest of the sums of radionuclides in SX Farm.

5.19.3 Calculation of PTE

Originally, the individual radionuclide results derived from the application of NDA results to the known source term were then multiplied by CAP-88 dose factors to arrive at an estimated dose equivalent of 5.7E-03 mrem/yr to the MEI.

A current evaluation incorporates the additional source term information contained in TWINS as well as the updated CAP-88 dose factors published in 2002. The individual radionuclide results derived from the application of NDA results to TWINS data baselined in 2001, have been multiplied by both the off site CAP-88 dose factor and the on site dose factor. The off site and on site results were each totaled. The largest of these sums results in 2.46E-03 mrem/yr to the off site individual. This is contained in Appendix K.

5.19.4 Tank Farm Stack Designation

Non-designated.

5.20 242-S EVAPORATOR STACK 296-S-18

5.20.1 System Description

The 242-S Evaporator building is located on the north side of the S-Tank Farm in the 200 West Area. The 242-S Evaporator was designed to remove water from non-boiling, high level liquid waste in the nearby 241-SY Tank Farm. It consists of a segmented building containing process, control, and personnel areas. The process portions of the facility (the "hot-side") contains the condenser room, the evaporator room, the ion exchange column room, the pump room, the load-out & storage room, and the loading dock.

The 296-S-18 stack system ventilates the 242-S Evaporator building, providing a negative pressure with respect to external areas for the containment of radioactive material which may have escaped the primary evaporator vessel housed in the evaporator room.

Inlet air is supplied through pre-heater, pre-filter, heater, water scrubber, and a blower system. The inlet air is then split into four air trains, passed through additional heaters and ventilates the evaporator, pump, condenser and loading dock areas. Exhaust air exists from the condenser room, ion exchange room, evaporator room and from the pump room. From there the flows are combined and pass through two parallel systems consisting of pre-filters, two HEPA filters, and blowers before being exhausted through the 296-S-18 stack.

The 242-S Evaporator is now in shutdown-standby mode.

HISTORICAL OVERVIEW

The 242-S Evaporator complex was started up in November of 1973 and operated very successfully until shutdown in November 1980. At that time the Evaporator was placed in Shutdown/Standby Condition II in 1981 which included flushing and removal of radioactive liquids from the facility. Because of future waste volume projections made at that time, in RHO-CD-80-615, "Tank Farm Waste Volume Projections", the facility was upgraded by addition of a pumpout system, by which the evaporator vessel could be pumped out to a double-shell tank in case of a shutdown during operation.

By 1985, with no restart order, the 242-S Evaporator was placed in Standby/Shutdown Condition III. This condition meant that the building would be maintained in such a manner that it could be restarted, recognizing that the startup time would be greater than six months.

In 1985, a transfer was made through the 242-S ion exchange column to reduce the uranium content in the U-1/U-2 crib groundwater. The transfer was sent through the 302-C tank and then through the ion exchange column. The C-100 condensate catch tank was used during column regeneration. The project was shutdown for the winter and never resumed. The 242-S Facility Shutdown/Standby Plan, SD-WM-SSP-002, dated 9/29/88 is available and explains what was done to place this facility in the current designated status of Standby/Shutdown Condition III. In addition Standard Operating Procedure TO-780-020, 242-S Shutdown/Standby Surveillance Routines provides the surveillances accomplished to ensure the facility remains in a safe configuration.

In December of 1994, a modification to the 242-S Evaporator building 296-S-18 exhaust system reduced the design capacity from 21,800 cubic feet per minute (cfm) to 6800 cfm. The following table reflects the modified evaporator room flow rate balances:

242-S Evaporator, 296-S-18 Ventilation Flow Balance Summary					
Room	Ventilation Supplied From	Flow Rate In (cfm)	Flow Rate Out (cfm)	Flow Rate Vented To	% of Flow to Exhauster
Loading Dock	Supplied Ventilation	290	1090	Loadout/ Storage	
	Outside Air	800			
	Total Air Supplied	1090			
Loadout/Storage	Loading Dock	1090	1090	Pump Room	
Pump	Loadout/Storage Room	1090			
	Supplied Ventilation	450			
	Evaporator Room	130			
	Total Air Supplied	1670	1670	Exhauster	24.56%
Evaporator	Supplied Ventilation	2110	130	Pump Room	
			1980	Exhauster	29.12%
Ion Exchange	Condenser Room	200	200	Exhauster	2.94%
Condensor	Supplied Ventilation	3150	200	Ion Exchange	
			2950	Exhauster	43.38%
				Total Flow to Exhauster	6,800

5.20.2 PTE Source Term Inventory and Assumptions

The potential to emit from this facility is based on air sample data documented in Radiation Survey Report Survey number 163308, dated 10-31-94 and survey number 200603091121, 200603091228, and 200603130918 dated 3/9/06 11:28 AM, 3/9/06 12:35, 3/13/06 10:04 respectively. Survey 163308 was taken in the pump room. The other surveys were taken in the condenser room.

The sample results of the air sample from survey 163308 8.0E-09 µCi/ml beta and 8.0E-12 µCi/ml alpha. The air sample results from the other surveys averaged 1.3E-11 µCi/ml beta and 8.3E-12 µCi/ml alpha.

It is assumed that the air sample concentration data represents the potential emissions. Therefore, the HEPA filter decontamination factors were not used to reduce the concentrations emitted by the ventilation system. The regulations require that potential emissions be determined under normal operational conditions, but with no emission controls in place (i.e. the HEPA Filters are not present).

Calculation of PTE

In the PTE estimate, the pump room air sample is used to represent air vented from the pump room as well as from the evaporator room. From the table above, this represents 53.7% of the air vented through the 296-S-18 exhauster. Likewise, the condenser room sample is used to represent air vented from the ion exchange column and from the condenser room. Again, from the table above, this represents 46.3% of the air vented through the 296-S-18 exhauster.

Flow rate and exhauster operating times used in the 2002 through 2004 annual reports are provided in the following table.

Stack 296-S-18 Flow Rate Data		
DATE	FLOW (cfm)	Stack Operating Time (hrs)
2002 CY Report	3570	4,708
2003 CY Report	4,284	1,034
2004 CY Report	3,324	2,972

The data shows that the average flow rate over these years was 3726 cfm and an average number of operating hours for the year of 2905 hours. Using this data, combined with the air sample data (the beta gamma was assumed to be Cs-137 and the alpha was assumed to be Am-241) and the percent each sample represents of the total air vented for a year, the average potential emissions for this unit are estimated to be 2.4E-02 mrem/yr to the on site individual. A conservative estimate, using a bounding flow rate of 5,000 cfm and an operating time of 5,000 hours, results in 5.45E-02 mrem/yr to the on site individual. These results are provided in Appendix L.

5.20.3 Tank Farm Stack Designation

Non-designated.

5.21 222-S LABORATORY STACK 296-S-21

5.21.1 System Description

The 222-S Laboratory Complex, located in the 200 West Area adjacent to the plutonium reduction-oxidation (REDOX) facility, provides analytical chemistry services for the Hanford Site projects, operations, and environmental cleanup activities. Laboratory personnel complete organic, inorganic, and radioisotope analysis of liquid and solid samples brought to the laboratory by the Hanford Site customers. The laboratory and office space have been progressively enlarged and upgraded as the mission warranted.

Construction of a new exhaust filter building (222-SE) and a hot cell expansion to the 222-S Laboratory Building was completed in 1994.

222-SB Filter Building—The 222-SB Filter Building, located south of the 222-S Laboratory Building, houses 96 high-efficiency particulate air (HEPA) filters to provide final filtration for the 222-S Laboratory. Under normal operation of the ventilation system, three electrically powered fans exhaust air from the 222-S Laboratory. Exhaust air leaves the 222-SB Filter Building through the 296-S-21 stack. If exhaust plenum differential pressure becomes too low, supplementary exhaust ventilation will be provided through the 222-SE Filter Building via direct drive diesel powered exhaust fan.

222-SC Filter Building—The 222-SC Filter Building, located north of the 222-S Laboratory Building, contains the second- and third-stage HEPA filtration for hot cells 1-A, 1-E-1, 1-E-2, 1-F, and 11-A-1 through 11-A-6. The hot cells in Rooms 1-A, 1-E, 1-F, and 11-A are serviced by the main building supply and exhaust ventilation. The 222-SC Filter Building houses five parallel pairs of HEPA filters, which provide filtration to hot cell exhaust air before it enters the main exhaust plenum and final filtering in the 222-SB and 222-SE Filter Buildings.

222-SE Filter Building—The 222-SE Filter Building, located south of the 222-S Laboratory Building, is a facility that houses 56 HEPA filters. This building provides redundant backup filtering capabilities for the 222-S Laboratory exhaust utilizing a diesel powered exhaust fan.

CFX Pit—The CFX Pit is located to the south of 222-SB Filter Building. It is a 5.2-m (17 ft) deep pit with 3.7 m (12 ft) of water shielding two ^{252}Cf sources which support delayed neutron activation analysis. These sources are encapsulated in U.S. Department of Transportation (DOT) special forms containers. Because the ^{252}Cf material is in DOT special forms containers, they are excluded from the 222-S Laboratory source term as specified in DOE-STD-1027-92.

Hot cells, also referred to as cubicles or shielded caves, are thick walled enclosures located in Rooms 1-A, 1-E, 1-F, and 11-A. The thick walls provide shielding to permit operations involving samples with a high level of radioactivity. Separate ventilation is provided, and the hot cells are maintained at a negative pressure with respect to the room. Airflow through the hot cells is designed to provide greater than seven air changes per hour.

Fume hoods are facilities for handling samples. A sash window is provided, and the ventilation is designed to provide a hood face velocity for confinement of chemical fumes and radioactive particulates.

The Room 2-B sample storage units consist of shielded compartments with lead plate on the sides and top. These units are used to store samples awaiting analysis. Directional airflow from the storage compartments over the samples minimizes the potential for a spread of contamination from an accidental spill

Two methods are used in the 222-S Laboratory Building to prevent release of airborne radioactivity to the environment or to laboratory work areas. One method, containment, is a physical barrier between the material or atmosphere containing radioactivity and the areas where personnel are permitted. The other method, confinement, depends on the ability of the building ventilation system to channel all air through HEPA filters. There are no design provisions for removing gaseous radioactive or chemical species from the air.

Physical barriers for airborne contamination control may be either partial or total and either single or multiple layer. Examples of total physical containment barriers in the laboratory are tightly closed sample containers and the hot cells. Hoods are examples of confinement barriers.

The 222-S Laboratory Building ventilation system is designed to ensure that air flows from areas of low contamination potential to areas of high contamination potential and is operated by maintaining zone differential pressures.

The major volume of exhaust air from the first floor is exhausted via the laboratory hoods or hot cells (Figure 2-6). Confinement of airborne radioactive particulates or chemical fumes is maintained with an air velocity through the face opening of the hoods. Hoods that do not conform to air velocity requirements are taken out of service. Laboratory hood and auxiliary exhaust air is filtered by a prefilter and single-stage HEPA filter before entering the exhaust ducts. Exhaust air from the basement service tunnels is filtered by a prefilter and single-stage HEPA filter. The individual exhausts are manifolded into a main exhaust duct that leads to the main exhaust plenum. Examination of old duct systems during exhaust system modifications indicated that holdup of radioactive materials was not present in the ductwork.

Building exhaust air is directed through the 222-SB Filter Building, located south of the 222-S Laboratory Building, housing 96 HEPA filters to provide final filtration. Under normal operation of the ventilation system, three electrically powered fans exhaust air from the laboratory. Exhaust air leaves the 222-SB Building through the 296-S-21 stack.

If the electrically powered exhaust fans fail to operate, emergency exhaust ventilation can be provided through the 222-SE Filter Building via an emergency diesel powered exhaust fan. The 222-SE Filter Building houses 56 HEPA filters. This building provides backup filtering capabilities for the building exhaust. The diesel exhaust fan provides approximately one-half of the normal exhaust ventilation flow rate and is used during a loss of electricity, fan failure, or during maintenance activities on the 222-SB Filter Building or exhaust fans.

<u>Hot Cell Ventilation</u>—Hot cells are cubicles generally built of steel and high-density concrete capable of reducing radiation dose rates from tens of rems per hour in the cubicle to <10 mrem/h through the outer wall. The hot cells are used for operations that exceed operating limits for the hoods. There are 10 hot cells in the 222-S Laboratory Building: one each in Rooms 1-A and 1-F; two in Room 1-E; and six in Room 11-A.

The main building exhaust ventilation services the hot cells. The hot cell ventilation operates to provide a differential pressure between room and cubicle operating areas, and airflow through the hot cells sufficient to provide adequate air dilution. Supply air to the hot cells is pulled through a single HEPA filter before entering the cell. This is to reduce contamination if reverse flow (from the cell to the room) should occur and to reduce dust loading on the first stage of exhaust HEPA filtration. Exhaust air from the cells passes first through a HEPA filter located as close as practical to the cell to avoid contaminating ductwork. The exhaust air then passes through the 222-SC Filter Building where it goes through two more stages of HEPA filters and then is ducted to the 222-SB Filter Building where it passes through one final stage of filtration before being exhausted to atmosphere. In the event that the diesel fan is in operation, the final HEPA filtration will be through the 222-SE Filter Building. In total, four stages of HEPA filtration are provided for the hot cell exhaust. Figure 2-6 shows the airflow path for the hot cell exhaust.

<u>Counting Room Ventilation</u>—The Counting Rooms (B-1-A, B-1-F, and B-1-G) and the scanning electron microscope Room (B-1-B) located in the basement are supplied by a ventilation system separate from the main 222-S Laboratory system. Most of the air is circulated through two stages of HEPA filtration with a small portion lost through louvered doors to the stairwell and used as supply ventilation air for the sample storage stairwell.

<u>The 219-S Ventilation System</u>—Two separate ventilation systems are used for contaminated areas in the 219-S Waste Handling Facility: an exhaust system for the vault storage tanks and an exhaust system for the sample gallery.

Exhaust air from the venting of the 219-S vault waste tanks is discharged through the 296-S-16 stack. A moisture de-entrainer and a single HEPA filter provide filtration.

During sample gallery use, ventilation air is exhausted from the sample gallery via an exhaust hood over the sample station, which is connected to an exhaust fan that maintains flow across the open portion of the hood. The exhaust air goes through double HEPA filtration and is discharged through the 296-S-23 stack.

The operating gallery has no significant contamination; therefore, no inlet or exhaust HEPA filtration is provided.

The air emissions from the main 296-S-21 stack of the 222-S Laboratory Building is now sampled continuously. The samples are analyzed to determine the quantity of alpha and beta radioactivity released to the atmosphere.

The air emissions from the 296-S-16 stack, which exhausts the 219-S Waste Handling Facility waste tanks, is periodically sampled and analyzed to determine the quantity of alpha and beta radioactivity released to the atmosphere.

The air emissions from the 296-S-23 stack, which exhausts the 219-S Waste Handling Facility sample gallery, is not sampled or monitored. Nondestructive assay (NDA) is performed to measure the activity on the HEPA filter as the method for periodic confirmatory measurements.

5.21.2 PTE Source Term Inventory and Assumptions

A Notice of Construction application for a Hot Cell expansion was submitted to WDOH and approved in 1991 and updated periodically. Facility inventory, assumptions and dose calculations were presented in that document. The PTE was derived by applying appendix D factors to what was considered the bounding facility inventory. The assumption was made that 43 solid samples and 12 liquid samples were handled each month.

An investigation into the radiological inventory residing in the 222-S Laboratory was completed in April 2002 (HNF-10754, *222-S Laboratory Radiological Inventory Comparison with Accident Dose Consequences*). The Best-Basis Inventory (BBI) estimates for radionuclides in the tank waste was utilized to provide radionuclide concentration data for samples being tracked in the facility inventory.

Historically, the laboratory source term included 15 isotopes. Conclusions presented in HNF-10754 indicate that plutonium, americium, cesium, and strontium account for approximately 97% of the dose equivalent curies (DE-Ci) for accident analysis. Therefore, the incremental contribution to dose consequences of all the other isotopes is considered negligible.

5.21.3 Calculation of PTE

The abated TEDE to the MEI, calculated in 1991 using AIRDOS.PC, resulted in 6.6E-03 mrem/yr to the off site individual. The unabated TEDE to the MEI was estimated at 6.0E-02 mrem.yr.

In 2001 and NDA was performed on the S-21 Stack HEPAs. The results indicated that the PTE was approximately 8.1E-07 mrem/yr. Subsequently this conclusion was found to be in error, as the abatement effect of HEPA filters upstream of the NDA were not taken into account in the evaluation.

Applying present CAP88-PC dispersion factors to the APQ identified for the facility results in a TEDE to the MEI of 1.38E-01 as shown below.

296-S-21 PTE Results									
Radio nuclide	Solid Inventory	Liquid Inventory	APQ	Release Fraction	APQ X RF	CAP88 off-site	CAP88 on-site	TEDE off-site	TEDE on-site
Sr-90+D	645	7.20E+01	9.68E+02	1.00E-03	7.17E-01	8.80E-02	1.10E-02	6.31E-02	7.89E-03
Cs-137+D	322.5	7.20E+01	3.23E+02	1.00E-03	3.95E-01	1.90E-01	3.10E-01	7.50E-02	1.22E-01
								1.38E-01	1.30E-01

5.21.4 Tank Farm Stack Designation

Designated.

5.22 242-T EVAPORATOR EXHAUSTER STACK 296-T-17

5.22.1 System Description

The 296-T-17 stack system ventilates the 242-T Evaporator building, providing a negative pressure with respect to external areas for the containment control of radioactive materials.

The 242-T Evaporator Facility is located in the 200 West Area of the Hanford Site between TY and TX Tank Farms. It was originally constructed in the early 1950s. The facility was operated as a batch evaporator unit until its shutdown in 1955. In 1965, modifications at the 242-T Evaporator Facility were made. The evaporator was restarted that same year and operated as a continuous evaporation process. During 1973, more modifications were made. The facility was used to neutralize and concentrate high and low salt acid waste from the Plutonium Refinishing Plant (Z Plant). This configuration continued from 1973 until 1976, when it was once again shutdown. Following this shutdown, a new Receiver Tank (R-1) was built. This receiver tank was used for only neutralization of Z Plant acid waste. This new operation continued until November of 1980. Use of the 242-T Facility in this capacity was concluded with the anticipated startup of the 244-TX Double Contained Receiver Tank (DCRT) which was completed in the spring of 1981. The 244-TX DCRT was built to replace the R-1 Receiver Tank in the Receiver Vault. With the shutdown which occurred in 1980, operation of the process areas were no longer required and were placed in Shutdown/Standby Condition V. This condition means that no further operational requirement exists. The control room area of the 242-T Evaporator Facility continued to be utilized in support of the salt well pumping program (the stabilization of the single shell tanks).

The 242-T Evaporator Facility consists of a control area and a process area. The control area is contained within the metal building adjacent to the east wall of the 242-T building. The control area consists of an operating room, a radiation/contamination control room, a lunch room, and a lavatory. The operating room contains instrumentation for the 242-T building and much of the process control equipment for the 241-TX Tank Farm. The operating room also housed instrumentation for the Salt Well Pumping Program. The radiation/contamination control room has storage for SWP Clothing, a shielded radiation survey area for people leaving the radiation zone and acts as a change room.

The process area includes the 242-T Building, the 242-TA Vault, and 242-TB Ventilation Building. The 242-T Building is a steel reinforced concrete structure 48 feet in length, 42 feet wide, and 23 feet high.

The 242-TA Vault is a concrete lined pit with a ground level steel cover. Inside this vault sits the 4,000 gallon R-1 Receiver Tank and the piping connecting this tank to the feed cell. Acetic high level waste from Z Plant flowed into this tank for pumpage to the feed cell.

The 242-TB Ventilation Building contains the ventilation equipment and instruments for the TB ventilation system. This ventilation system serviced the R-1 Receiver Tank and the TA Vault. The R-1 Receiver Tank has been isolated.

The process area consists of the Condensate Area, the Feed Cell, and the Evaporator Area. The Condensate Area (called the cold cell) contains two 4,000 gallon condensate catch tanks, a scrubber, condenser, floor sump, and interconnecting piping between the feed and hot cells and the TX Tank Farm. The Feed Cell houses the 4,000 gallon B-1 Blend Tank plus the interconnecting piping between this tank, the evaporator vessel, and the 241-TX Tank Farm. The B-1 Blend Tank was configured to receive liquid from the hot cell sump. A pump out system was installed to remove the liquid accumulated in this tank to the Tank Farms. The Evaporator Area (called the hot cell) contains the evaporator vessel, a cyclone separator, the cyclone separator catch tank, two evaporator feed preheaters, a floor sump, and interconnecting piping between the feed and cold cells and the TX Tank Farm.

The Evaporator was chemically flushed in 1976. Because of the extremely high radiation levels (9 RAD) within the Hot Cell, no effort was made to decontaminate it or the equipment within it. Line blanking and instrument disabling, etc, was, however, performed just after they left this room. The hot cell jet pump and associated gang valve system was left functioning to jet accumulated liquids to the B-1 Blend Tank. The cold cell was decontaminated to a level where entry could be made without a mask.

Three HEPA filtered ventilation exhaust systems are in place at the 242-T Evaporator Facility. The smallest system (the Vessel Ventilation System) was built to exhaust the two catch tanks in the Condensate Area, the evaporator vessel and attached cyclone separator, catch tank, two feed preheater tanks, and interconnecting piping. The exhauster for this ventilation system is located at the east wall of the Condensate Area, just downstream of the filters. This system is no longer in service. A 50 cubic feet per minute (cfm) capacity HEPA filter was placed on the Vessel Ventilation system to serve as a breather filter for the condensate catch tanks. The Vessel Ventilation Stack Sampler and associated radiation alarm switches, alarms, and sensing elements were disabled. The Vessel Ventilation Exhauster was disconnected as well.

A second exhaust system is housed inside the 242-TB building. This exhauster was built to vent the 242-TA Vault and the R-1 receiver tank, the Feed Cell B-1 tank, the Feed Cell, and the Evaporator Area. The 242-TB exhaust system is also no longer in service. The system was replaced by breather filters on the R-1 Receiver Tank and the TA Vault area. The TB Ventilation fan was disconnected. The Stack Radiation Monitoring/Sampling System was disabled and disconnected.

The third ventilation system exhausts the Evaporator Area (the hot area), the Feed Cell, through the Evaporator Area, and the Condensate Area (the cold area), separately, but at a lower vacuum flow. This ventilation system is the largest and only operating exhaust system at the 242-T Evaporator. It is normally operated at a flow rate of 1,500 ft3/min or less. It is powered by one of two electric fans, each rated at 2,000 ft3/min. The stack is 1 foot in diameter and is 15 feet high. The system includes an inlet plenum, a preheater for the inlet air, and two HEPA filters upstream of the fan. A reserve bank of HEPA filters parallels the system. The heater is electric. It heats the air above saturation to prevent water damage to the HEPA filters. This ventilation system is currently operated to reduce hazards associated with airborne radioactivity at the 242-T Evaporator facility. This ventilation system has sufficient capacity to maintain the required negative pressure in the cold area, the hot area, and the feed cells. The steam to the Building Ventilation HEPA filter preheater has been turned off. The condensate return line was rerouted to the Cold Cell Sump which is subsequently transferred to the Condensate Catch Tanks. The Condensate Catch Tanks were continued as collection vessels for liquids jetted from the 242-T

Cold Cell Sump. The accumulated liquid is subsequently transferred to the double shelled tank farms (TK-102-SY).

5.22.2 PTE Source Term Inventory and Assumptions

Because the 242-T evaporator was connected to the TX Tank Farm, the radionuclides reported in the TWINS database for the TX Tank Farms was used as the source term for this PTE determination.

An NDA was performed on HEPA filters K2-4-5 and K2-4-7 on 9/5/00 when they were first changed out. These filters represent one of two separate vent paths for this facility's ventilation system. The results of this NDA, indicating a total of 5.4E-04 curies of Cs-137 on both filters, were transmitted from Larry Diediker, to Kari McDaniel on September 21, 2000 in an email, subject RE: NDA of 242-T HEPAs.

Since these filters represent one of two possible ventilation flow paths, it was assumed that this flow path was used at least half the time. This assumption is based on the fact that the normal operating strategy at Tank Farms is to use parallel systems equally so that the wear is evenly distributed.

5.22.3 Calculation of PTE

The TX Tank Farm source term obtained from a 2006 TWINS query was totaled. A ratio was determined for the sum of Cs-137 found on the 242-T filters to the sum of Cs-137 found in all the TX Tank Farm tanks. This ratio was then multiplied by each of the remaining radionuclides in TX Farm and further multiplied by both the off site CAP-88 dose factor and the on site dose factor. The sums of the off site and on site results were compared. The largest of these sums, 2.37E-04 mrem/yr to the on site individual, was cited as the PTE. The computation is presented in Appendix M.

5.22.3 Tank Farm Stack Designation

Non-designated.

5.23 500 CFM PORTABLE EXHAUSTER SKIDS POR-04, 05, 06, AND 03, STACKS 296-P-43, 296-P-44, 296-P-45, AND 296-P-48 RESPECTIVELY

5.23.1 System Description

Portable, 500 cfm ventilation systems may be installed on SST risers and consist of a skid mounted HEPA filter (two stages) portable exhauster. These exhausters are permitted for use in the "Radioactive Air Emissions Notice of Construction Application for a Categorical Tank Farm Facility Waste Retrieval and Closure: Phase II – Waste Retrieval Operations." The portable exhausters are designed to pass outside air through the tank, thereby reducing condensation and fog within the tank, and filter that air during exhauster operations before exiting to the atmosphere.

Ductwork is used to connect the exhauster inlet to the tank riser. The abatement technology for a skid mounted ventilation system includes heaters, a pre-filter, a demister, two HEPA filters in series, a fan, and a 17 foot high, 10-inch diameter stack positioned on up to 4 feet of dunnage.

5.23.2 PTE Source Term Inventory and Assumptions

The total APQ for all 149 single shell tanks was used to determine emissions during waste retrieval activities. The radionuclides in each of the SST's consist of radionuclides listed in the TWINS Database as of December 2002. Due to the differences in tank content and annual possession quantity (APQ) for each individual tank, a worst case scenario of ten SSTs retrievals per year on average utilizing tanks estimated to produce the highest unabated and abated PTE TEDE to the MEI was assumed as the basis for emissions calculations.

Activities that contribute to these emissions included riser entries, equipment removal and installation, installation and operation of double contained over ground HIHTL, active and passive ventilation during waste retrieval operations, and some transfer line interim isolations between SSTs. This dose estimate is conservative for purposes of bounding operations. The PTE source term inventory is more fully described in the Notice of Construction (NOC) referenced above.

5.23.3 Calculation of PTE

If the 149 SSTs were retrieved in one year the unabated potential to emit (PTE) is estimated to result in a TEDE to the MEI of 8,945.96 mrem per year, while the abated PTE is estimated to result in a TEDE to the hypothetical MEI of 15.59 mrem per year. The annual average for the 22 year project life cycle is a potential TEDE to the MEI of 406.63 mrem per year, and the abated potential TEDE to the MEI is 0.71 mrem per year.

The possible use of Double Shell Tank supernatant as a sluicing solution could generate an unabated TEDE to the MEI of 1205.08 mrem per year, assuming 34 million gallons per year (twice the volume of currently stored supernatant), and an abated TEDE to the MEI of 0.60 mrem per year.

Therefore, the final estimated potential TEDE to the MEI based on the value of the annual average for SSTs plus the value for using 34 million gallons per year of supernatant would be 1.61E+03 mrem/yr and the potential abated TEDE to the MEI would be 1.31 mrem per year.

These estimates were achieved by applying the appendix D release factors and CAP-88 dispersion factors to the APQ described in section 5.23.2 of this document.

5.23.4 Tank Farm Stack Designation

Designated.

5.24 1000 CFM PORTABLE EXHAUSTER CFM SKID POR-08 STACK 296-P-47

5.24.1 System Description

Portable, 1000 cfm ventilation systems may be installed on SST risers and consist of a skid mounted HEPA filter (two stages) portable exhauster. These exhausters are permitted for use in the "Radioactive Air Emissions Notice of Construction Application for a Categorical Tank Farm Facility Waste Retrieval and Closure: Phase II – Waste Retrieval Operations." The portable exhausters are designed to pass outside air through the tank, thereby reducing condensation and fog within the tank, and filter that air during exhauster operations before exiting to the atmosphere.

Ductwork is used to connect the exhauster inlet to the tank riser. The abatement technology for a skid mounted ventilation system includes heaters, a pre-filter, a demister, two HEPA filters in series, a fan, and a 17 foot high, 10-inch diameter stack, positioned on up to 4 feet of dunnage.

5.24.2 PTE Source Term Inventory and Assumptions

The PTE source term inventory is fully described in the Notice of Construction (NOC) referenced above and summarized in section 5.23.2 of this document.

5.24.3 Calculation of PTE

The PTE for Waste Retrieval activities via use of these exhausters is fully described in the NOC referenced above and summarized in section 5.23.3 of this document.

5.24.4 Tank Farm Stack Designation

Designated.

5.25 3000 CFM PORTABLE EXHAUSTER SKIDS POR-126 AND 127 STACKS 296-P-49, 296-P-50 RESPECTIVELY

5.25.1 System Description

Portable, 3000 cfm ventilation systems may be installed on SST risers and consist of a skid mounted HEPA filter (two stages) portable exhauster. These exhausters are permitted for use in the "Radioactive Air Emissions Notice of Construction Application for a Categorical Tank Farm Facility Waste Retrieval and Closure: Phase II – Waste Retrieval Operations." The portable exhausters are designed to pass outside air through the tank, thereby reducing condensation and fog within the tank, and filter that air during exhauster operations before exiting to the atmosphere.

Ductwork is used to connect the exhauster inlet to the tank riser. The abatement technology for a skid mounted ventilation system includes heaters, a pre-filter, a demister, two HEPA filters in series, a fan, and a 17 foot high, 10-inch diameter stack, positioned on up to 4 feet of dunnage..

5.25.2 PTE Source Term Inventory and Assumptions

The PTE source term inventory is fully described in the Notice of Construction (NOC) referenced above and summarized in section 5.23.2 of this document.

5.25.3 Calculation of PTE

The PTE for Waste Retrieval activities via use of these exhausters is fully described in the NOC referenced above and summarized in section 5.23.3 of this document.

5.25.4 Tank Farm Stack Designation

Designated.

6.0 REFERENCES

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SD-WM-SSP-002, *242-S Facility Shutdown/Standby Plan*, dated September 29, 1988.

Tank Waste Information Network System (TWINS) data base, Best Basis Inventory, Best Basis Summary.

APPENDIX A-1

702-AZ Potential Emission Estimate

Analyte	CAP-88, East Area		Unabated Emissions of TWINS Data		Appendix D Release Factor	Sum of AY and AZ Tanks
	Off site MPR	On site MPR	Off site MPR	On site MPR		Ci
	mrem/Ci		mrem/yr			
	B	C	D=B*F*G	E=C*F*G	F	G
3H	2.5E-05	7.1E-06	4.7E-03	1.3E-03	1.0E+00	1.87E+02
14C	1.9E-03	1.8E-04	2.3E-02	2.2E-03	1.0E+00	1.21E+01
59Ni	3.1E-04	2.9E-04	2.7E-05	2.6E-05	1.0E-03	8.84E+01
60Co	2.5E-01	3.0E-01	5.2E-01	6.3E-01	1.0E-03	2.10E+03
63Ni	2.6E-04	6.9E-05	2.1E-03	5.7E-04	1.0E-03	8.24E+03
79Se	1.3E-01	1.5E-01	7.6E-04	8.7E-04	1.0E-03	5.82E+00
90Y	3.4E-04	2.6E-04	5.4E+00	4.2E+00	1.0E-03	1.60E+07
90Sr	1.1E-01	9.5E-03	1.8E+03	1.5E+02	1.0E-03	1.60E+07
93Zr	1.3E-03	1.3E-03	7.0E-04	7.0E-04	1.0E-03	5.39E+02
93mNb	2.1E-03	1.2E-03	6.7E-04	3.8E-04	1.0E-03	3.18E+02
99Tc	2.3E-02	1.4E-03	4.5E-02	2.7E-03	1.0E-03	1.96E+03
106Ru	2.0E-02	1.9E-02	3.4E-03	3.3E-03	1.0E-03	1.72E+02
113mCd	1.3E-01	1.5E-01	1.1E-01	1.3E-01	1.0E-03	8.68E+02
125Sb	2.6E-02	3.3E-02	2.4E-01	3.1E-01	1.0E-03	9.25E+03
126Sn	4.7E-02	4.1E-02	1.3E-03	1.1E-03	1.0E-03	2.74E+01
129I	2.0E-01	2.2E-02	1.3E-04	1.4E-05	1.0E-03	6.42E-01
134Cs	1.0E-01	4.7E-02	2.5E-01	1.2E-01	1.0E-03	2.49E+03
137Cs	2.4E-01	2.7E-01	2.2E+03	2.5E+03	1.0E-03	9.20E+06
137mBa	5.3E-13	1.0E-11	4.6E-09	8.7E-08	1.0E-03	8.67E+06
151Sm	7.5E-04	8.4E-04	5.1E-01	5.7E-01	1.0E-03	6.76E+05
152Eu	2.4E-01	3.1E-01	1.7E-01	2.2E-01	1.0E-03	6.94E+02
154Eu	2.0E-01	2.5E-01	6.3E+00	7.9E+00	1.0E-03	3.17E+04
155Eu	8.0E-03	9.8E-03	2.4E-01	2.9E-01	1.0E-03	2.98E+04
226Ra	4.6E-01	2.5E-01	2.9E-07	1.6E-07	1.0E-03	6.28E-04
227Ac	1.5E+01	1.8E+01	8.8E-05	1.1E-04	1.0E-03	5.84E-03
228Ra	1.9E-01	7.0E-02	2.0E-05	7.4E-06	1.0E-03	1.06E-01
229Th	1.6E+01	2.0E+01	2.1E-06	2.6E-06	1.0E-03	1.32E-04
231Pa	1.2E+01	1.4E+01	3.5E-04	4.1E-04	1.0E-03	2.93E-02
232U	1.1E+01	1.3E+01	1.4E-04	1.6E-04	1.0E-03	1.25E-02
232Th	8.0E+00	1.0E+01	1.1E-03	1.4E-03	1.0E-03	1.40E-01
233U	3.1E+00	3.7E+00	1.8E-03	2.2E-03	1.0E-03	5.88E-01
234U	3.1E+00	3.7E+00	1.5E-02	1.8E-02	1.0E-03	4.90E+00
235U	3.0E+00	3.5E+00	5.9E-04	6.9E-04	1.0E-03	1.97E-01
236U	2.9E+00	3.5E+00	1.1E-03	1.3E-03	1.0E-03	3.68E-01
237Np	1.2E+01	1.4E+01	4.8E-01	5.6E-01	1.0E-03	4.03E+01
238Pu	7.6E+00	8.9E+00	3.3E+00	3.9E+00	1.0E-03	4.33E+02
238U	2.8E+00	3.3E+00	1.1E-02	1.3E-02	1.0E-03	3.80E+00
239Pu	8.2E+00	9.5E+00	3.9E+01	4.5E+01	1.0E-03	4.79E+03
240Pu	8.2E+00	9.5E+00	1.0E+01	1.2E+01	1.0E-03	1.26E+03
241Pu	1.3E-01	1.5E-01	2.7E+00	3.2E+00	1.0E-03	2.11E+04
241Am	1.3E+01	1.5E+01	9.4E+02	1.1E+03	1.0E-03	7.22E+04

702-AZ Potential Emission Estimate

Analyte	CAP-88, East Area		Unabated Emissions of TWINS Data		Appendix D Release Factor	Sum of AY and AZ Tanks
	Off site MPR	On site MPR	Off site MPR	On site MPR		Ci
	mrem/Ci		mrem/yr			
	B	C	D=B*F*G	E=C*F*G	F	G
242Pu	7.8E+00	9.1E+00	1.1E-03	1.2E-03	1.0E-03	1.35E-01
242Cm	4.1E-01	5.0E-01	2.5E-02	3.1E-02	1.0E-03	6.12E+01
243Am	1.3E+01	1.5E+01	4.3E-01	5.0E-01	1.0E-03	3.33E+01
243Cm	8.5E+00	1.0E+01	6.8E-02	8.0E-02	1.0E-03	7.95E+00
244Cm	6.7E+00	8.0E+00	1.2E+00	1.5E+00	1.0E-03	1.85E+02
Total			4.98E+03	3.8E+03		

APPENDIX A-2

702-AZ PIC Designation Calculation Spread Sheet for PTE Determination During Mixer Pump Operation

Analyte Baselined 2001	AY-101 Emissions for Mixer Pump Operating 450 hrs/yr	AY-102 Emissions for Mixer Pump Operating 450 hrs/yr	AZ-101 Emissions for Mixer Pump Operating 2450 hrs/yr	AZ-102 Emissions for Mixer Pump Operating 450 hrs/yr	Total Emissions	CAP-88 Dispersion Factor for East Area: Off site MPR	CAP-88 Dispersion Factor for East Area: On site MPR	PTE to MEI: Off site MPR	PTE to MEI: On site MPR	% of PTE
	Ci/yr	Ci/yr	Ci/yr	Ci/yr	Ci/yr	mrem/Ci		mrem/yr		
	A	B	C	D	H=A+B+C+D	I	J	K=H*I	L=H*J	M=L/SumL
3H	1.6E-01	8.3E-01	2.4E+00	5.2E+00	8.6E+00	2.50E-05	7.10E-06	2.1E-04	6.1E-05	0.00%
14C	3.9E-02	2.8E-02	2.7E-01	1.5E-01	4.9E-01	1.90E-03	1.80E-04	9.3E-04	8.8E-05	0.01%
59Ni	2.7E-05	1.9E-05	2.2E-05	1.8E-06	6.9E-05	3.10E-04	2.90E-04	2.1E-08	2.0E-08	0.00%
60Co	7.4E-05	1.8E-06	9.5E-04	1.4E-04	1.2E-03	2.50E-01	3.00E-01	2.9E-04	3.5E-04	0.02%
63Ni	2.5E-03	1.7E-03	2.4E-03	2.0E-04	6.9E-03	2.60E-04	6.90E-05	1.8E-06	4.7E-07	0.00%
79Se	2.3E-06	2.5E-08	4.1E-06	3.0E-07	6.7E-06	1.30E-01	1.50E-01	8.7E-07	1.0E-06	0.00%
90Sr	5.2E-02	2.0E-01	6.6E-01	1.1E-01	1.0E+00	1.10E-01	9.50E-03	1.1E-01	9.7E-03	0.62%
90Y	2.3E-01	8.9E-01	4.1E+00	5.0E-01	5.7E+00	3.40E-04	2.60E-04	1.9E-03	1.5E-03	0.09%
93mNb	8.4E-05	1.5E-06	1.6E-04	1.1E-05	2.6E-04	2.10E-03	1.20E-03	5.4E-07	3.1E-07	0.00%
93Zr	1.0E-04	1.8E-06	2.6E-04	1.9E-05	3.8E-04	1.30E-03	1.30E-03	4.9E-07	4.9E-07	0.00%
99Tc	9.4E-06	5.6E-06	1.0E-03	1.3E-04	1.2E-03	2.30E-02	1.40E-03	2.7E-05	1.6E-06	0.00%
106Ru	1.1E-08	1.3E-09	3.2E-04	1.0E-04	4.2E-04	2.00E-02	1.90E-02	8.4E-06	8.0E-06	0.00%
113mCd	2.9E-04	4.3E-06	1.9E-03	1.5E-04	2.3E-03	1.30E-01	1.50E-01	3.0E-04	3.5E-04	0.02%
125Sb	3.4E-06	1.4E-06	8.4E-03	1.4E-03	9.8E-03	2.60E-02	3.30E-02	2.5E-04	3.2E-04	0.02%
126Sn	4.7E-06	2.5E-07	2.6E-05	2.4E-06	3.3E-05	4.70E-02	4.10E-02	1.5E-06	1.3E-06	0.00%
129I	1.6E-08	7.6E-09	3.2E-07	2.6E-07	6.0E-07	2.00E-01	2.20E-02	1.2E-07	1.3E-08	0.00%
134Cs	4.5E-08	3.6E-05	1.2E-02	4.8E-04	1.3E-02	1.00E-01	4.70E-02	1.3E-03	6.0E-04	0.04%
137Cs	1.2E-02	3.6E-02	4.9E+00	6.5E-01	5.6E+00	2.40E-01	2.70E-01	1.3E+00	1.5E+00	96.21%
137mBa	1.1E-02	3.4E-02	4.7E+00	6.1E-01	5.3E+00	5.30E-13	1.00E-11	2.8E-12	5.3E-11	0.00%
151Sm	7.2E-02	1.4E-03	1.7E-01	1.3E-02	2.6E-01	7.50E-04	8.40E-04	1.9E-04	2.2E-04	0.01%
152Eu	4.2E-05	1.0E-05	3.3E-04	1.7E-05	4.0E-04	2.40E-01	3.10E-01	9.5E-05	1.2E-04	0.01%
154Eu	7.9E-04	1.1E-03	1.1E-02	1.3E-03	1.4E-02	2.00E-01	2.50E-01	2.9E-03	3.6E-03	0.23%
155Eu	3.8E-04	9.3E-04	1.5E-02	2.2E-03	1.8E-02	8.00E-03	9.80E-03	1.5E-04	1.8E-04	0.01%

702-AZ PIC Designation Calculation Spread Sheet for PTE Determination During Mixer Pump Operation

Analyte - Baselined 2001	AY-101 Emissions for Mixer Pump Operating 450 hrs/yr	AY-102 Emissions for Mixer Pump Operating 450 hrs/yr	AZ-101 Emissions for Mixer Pump Operating 2450 hrs/yr	AZ-102 Emissions for Mixer Pump Operating 450 hrs/yr	Total Emissions	CAP-88 Dispersion Factor for East Area: Off site MPR	CAP-88 Dispersion Factor for East Area: On site MPR	PTE to MEI: Off site MPR	PTE to MEI: On site MPR	% of PTE
	Ci/yr	Ci/yr	Ci/yr	Ci/yr	Ci/yr	mrem/Ci		mrem/yr		
226Ra	4.2E-10	1.6E-10	3.2E-11	7.5E-12	6.2E-10	4.60E-01	2.50E-01	2.8E-10	1.5E-10	0.00%
227Ac	2.4E-09	5.7E-10	3.6E-10	7.4E-11	3.4E-09	1.50E+01	1.80E+01	5.0E-08	6.0E-08	0.00%
228Ra	1.9E-09	1.4E-09	1.4E-10	2.7E-10	3.7E-09	1.90E-01	7.00E-02	7.1E-10	2.6E-10	0.00%
229Th	3.3E-11	2.9E-13	2.7E-13	2.7E-12	3.6E-11	1.60E+01	2.00E+01	5.7E-10	7.2E-10	0.00%
231Pa	3.1E-09	8.7E-11	1.1E-09	2.0E-10	4.4E-09	1.20E+01	1.40E+01	5.3E-08	6.2E-08	0.00%
232Th	1.7E-09	2.5E-09	3.7E-10	4.1E-10	5.0E-09	8.00E+00	1.00E+01	4.0E-08	5.0E-08	0.00%
232U	4.8E-09	1.3E-11	1.3E-09	4.5E-10	6.5E-09	1.10E+01	1.30E+01	7.2E-08	8.5E-08	0.00%
233U	2.0E-08	2.0E-13	5.2E-09	1.7E-09	2.7E-08	3.10E+00	3.70E+00	8.2E-08	9.8E-08	0.00%
234U	8.7E-09	5.5E-08	3.6E-08	1.2E-07	2.2E-07	3.10E+00	3.70E+00	6.8E-07	8.1E-07	0.00%
235U	3.5E-10	2.1E-09	1.4E-09	2.9E-09	6.7E-09	3.00E+00	3.50E+00	2.0E-08	2.4E-08	0.00%
236U	3.0E-10	4.0E-09	2.9E-09	5.9E-09	1.3E-08	2.90E+00	3.50E+00	3.8E-08	4.6E-08	0.00%
237Np	8.8E-09	2.0E-07	6.2E-07	5.6E-07	1.4E-06	1.20E+01	1.40E+01	1.7E-05	1.9E-05	0.00%
238Pu	8.0E-06	2.2E-05	6.1E-06	7.5E-06	4.4E-05	7.60E+00	8.90E+00	3.3E-04	3.9E-04	0.02%
238U	7.9E-09	4.2E-08	2.5E-08	4.9E-08	1.2E-07	2.80E+00	3.30E+00	3.5E-07	4.1E-07	0.00%
239Pu	2.1E-05	6.8E-05	5.3E-05	6.5E-05	2.1E-04	8.20E+00	9.50E+00	1.7E-03	2.0E-03	0.12%
240Pu	6.4E-06	1.5E-05	1.6E-05	1.9E-05	5.6E-05	8.20E+00	9.50E+00	4.6E-04	5.4E-04	0.03%
241Am	3.6E-04	3.2E-04	1.2E-03	7.8E-04	2.6E-03	1.30E+01	1.50E+01	3.4E-02	3.9E-02	2.50%
241Pu	1.2E-04	1.8E-04	4.7E-04	5.6E-04	1.3E-03	1.30E-01	1.50E-01	1.7E-04	2.0E-04	0.01%
242Cm	4.8E-07	5.8E-07	1.1E-06	2.7E-07	2.4E-06	4.10E-01	5.00E-01	9.8E-07	1.2E-06	0.00%
242Pu	1.2E-09	1.8E-09	2.5E-09	2.8E-09	8.2E-09	7.80E+00	9.10E+00	6.4E-08	7.4E-08	0.00%
243Am	3.7E-08	2.3E-08	2.5E-07	2.3E-07	5.4E-07	1.30E+01	1.50E+01	7.0E-06	8.1E-06	0.00%
243Cm	4.9E-08	5.3E-08	1.5E-07	3.5E-08	2.9E-07	8.50E+00	1.00E+01	2.5E-06	2.9E-06	0.00%
244Cm	1.7E-06	1.3E-06	3.5E-06	1.7E-06	8.1E-06	6.70E+00	8.00E+00	5.4E-05	6.5E-05	0.00%
							Total	1.5E+00	1.6E+00	100%

APPENDIX B

242-Evaporator Building 296-A-21 PTE Results								
	CAP-88 East Area						TEDE to the MEI	
Analyte	Off site MPR	On site MPR		Quantity	Release Factor	Potential Quantity Released	Off site MPR	On site MPR
	mrem/Ci			Ci		Ci	mrem/yr	
Total Beta (90Sr)	1.10E-01	9.50E-03	Liquid	1.80E-04	1.00E-03	1.8E-07	1.98E-08	1.71E-09
Total Alpha (241Am)	1.30E+01	1.50E+01	Liquid	9.50E-02	1.00E-03	9.50E-05	1.24E-03	1.43E-03
							1.24E-03	1.43E-03
Original Estimate (mrem/yr)							6.60E-06	

APPENDIX C

242-A Evaporator Vessel Vent Stack 296-A-22

Radio-nuclide	Physical/Chemical Form	Quantity (Ci)	Release Factor	Potential Quantity Released (Ci)	Projected Dose (mrem/yr)	CAP-88 pre 2002 (mrem/Ci)	CAP-88 2002 On site(mrem/Ci)	TEDE to MEI 2002 (mrem/yr)
C-14	Liquid	1.80E+05	1.45E-12	2.6E-07	6.90E-10	2.64E-03	1.80E-04	4.70E-11
Co-60	Liquid	4.20E+04	1.45E-12	6.1E-08	1.80E-09	2.96E-02	3.00E-01	1.83E-08
Se-79	Liquid	2.70E+03	1.45E-12	3.9E-09	2.60E-10	6.64E-02	1.50E-01	5.87E-10
Sr-90	Liquid	7.70E+06	1.45E-12	1.1E-05	4.90E-07	4.39E-02	9.50E-03	1.06E-07
Nb-94	Liquid	3.40E+03	1.45E-12	4.9E-09	1.30E-10	2.64E-02	1.00E+00	4.93E-09
Tc-99	Liquid	7.00E+04	1.45E-12	1.0E-07	1.10E-10	1.08E-03	1.40E-03	1.42E-10
Ru-106	Liquid	1.80E+06	1.45E-12	2.6E-06	5.60E-08	2.15E-02	1.90E-02	4.96E-08
I-129	Liquid	9.10E+01	1.45E-12	1.3E-10	3.80E-11	2.88E-01	2.20E-02	2.90E-12
Cs-134	Liquid	5.20E+05	1.45E-12	7.5E-07	2.40E-08	3.18E-02	4.70E-02	3.54E-08
Cs-137	Liquid	5.20E+07	1.45E-12	7.5E-05	1.80E-06	2.39E-02	2.70E-01	2.04E-05
Eu-154	Liquid	1.70E+05	1.45E-12	2.5E-07	4.50E-09	1.83E-02	2.50E-01	6.16E-08
Eu-155	Liquid	2.40E+05	1.45E-12	3.5E-07	6.30E-10	1.81E-03	9.80E-03	3.41E-09
Ra-226	Liquid	1.10E+03	1.45E-12	1.6E-09	9.10E-10	5.71E-01	2.50E-01	3.99E-10
Pu-238	Liquid	4.50E+01	1.45E-12	6.5E-11	5.30E-11	8.12E-01	8.90E+00	5.81E-10
Pu-239/240	Liquid	5.60E+03	1.45E-12	8.1E-09	7.00E-08	8.62E+00	9.50E+00	7.71E-08
Pu-241	Liquid	5.20E+05	1.45E-12	7.5E-07	1.00E-07	1.33E-01	1.50E-01	1.13E-07
Am-241	Liquid	3.50E+04	1.45E-12	5.1E-08	6.60E-07	1.30E+01	1.50E+01	7.61E-07
Cm-244	Liquid	4.50E+02	1.45E-12	6.5E-10	4.50E-09	6.90E+00	8.00E+00	5.22E-09
					3.21E-06			2.16E-05

Appendix D-1

SY Condensate PTE Results for Use in East Area

Sample#	Analyte	Results		CAP-88 East Area		PTE East Area	
				Off site MPR	On site MPR	Off site MPR	On site MPR
		uCi/mL	Ci	mrem/Ci		mrem/yr	
		C	D=C*195*1000*3.785 /1000000	E	F	G=D*E	H=D*F
S01T000718	Technetium-99 Liq. Scint.	4.34E-05	3.20E-05	2.30E-02	1.40E-03	7.37E-07	4.48E-08
S01T000718	Sr-89/90 Env. Liquids/Filter	2.33E-05	1.72E-05	1.10E-01	9.50E-03	1.89E-06	1.63E-07
S01T000718	Tritium By Lachat	2.10E-04	1.55E-04	2.50E-05	7.10E-06	3.87E-09	1.10E-09
S01T000718	Cesium-137 by GEA	8.00E-02	5.90E-02	2.40E-01	2.70E-01	1.42E-02	1.59E-02
Condensate Est. Gallons:	195				Total	1.42E-02	1.59E-02

APPENDIX D-2

SY Condensate PTE for Use in West Area

Sample#	Analyte	Results		CAP-88 West Area		PTE West Area	
				Off site MPR	On site MPR	Off site MPR	On site MPR
		uCi/mL	Ci	mrem/Ci		mrem/yr	
		C	D=C*195*1000*3.785 /1000000	E	F	G=D*E	H=D*F
S01T000718	Technetium-99 Liq. Scint.	4.34E-05	3.20E-05	1.80E-02	1.80E-03	5.77E-07	5.77E-08
S01T000718	Sr-89/90 Env. Liquids/Filter	2.33E-05	1.72E-05	8.80E-02	1.10E-02	1.51E-06	1.89E-07
S01T000718	Tritium By Lachat	2.10E-04	1.55E-04	2.50E-05	1.10E-05	3.87E-09	1.70E-09
S01T000718	Cesium-137 by GEA	8.00E-02	5.90E-02	1.90E-01	3.10E-01	1.12E-02	1.83E-02
Condensate Est. Gallons:	195				Total	1.12E-02	1.83E-02

APPENDIX E

AW 296-A-27 PTE Results

Analyte	CAP-88 East Area		Unabated Emissions		NDA Results	Normalized Results	NDA Gamma to Total Ratio	Maximum Analyte Value from TWINS Data Base
	Off site MPR	On site MPR	Off site MPR	On site MPR				
	mrem/Ci		mrem/yr		Ci	Ci		Ci
	B	C	D=B*G	E=C*G	F	G=H*I	H=4.0E-02/I	I
3H	2.50E-05	7.10E-06	3.22E-11	9.15E-12		1.29E-06	2.33E-08	5.54E+01
14C	1.90E-03	1.80E-04	1.71E-09	1.62E-10		8.98E-07	2.33E-08	3.86E+01
59Ni	3.10E-04	2.90E-04	3.04E-11	2.84E-11		9.79E-08	2.33E-08	4.21E+00
60Co	2.50E-01	3.00E-01	5.24E-07	6.29E-07		2.10E-06	2.33E-08	9.02E+01
63Ni	2.60E-04	6.90E-05	2.41E-09	6.39E-10		9.26E-06	2.33E-08	3.98E+02
79Se	1.30E-01	1.50E-01	7.95E-09	9.17E-09		6.12E-08	2.33E-08	2.63E+00
90Y	3.40E-04	2.60E-04	6.92E-07	5.29E-07		2.03E-03	2.33E-08	8.75E+04
90Sr	1.10E-01	9.50E-03	2.24E-04	1.93E-05		2.03E-03	2.33E-08	8.75E+04
93mNb	2.10E-03	1.20E-03	1.74E-09	9.93E-10		8.28E-07	2.33E-08	3.56E+01
93Zr	1.30E-03	1.30E-03	1.50E-09	1.50E-09		1.15E-06	2.33E-08	4.96E+01
99Tc	2.30E-02	1.40E-03	4.47E-07	2.72E-08		1.94E-05	2.33E-08	8.35E+02
106Ru	2.00E-02	1.90E-02	2.01E-09	1.91E-09		1.01E-07	2.33E-08	4.33E+00
113mCd	1.30E-01	1.50E-01	5.93E-07	6.84E-07		4.56E-06	2.33E-08	1.96E+02
125Sb	2.60E-02	3.30E-02	3.63E-07	4.61E-07		1.40E-05	2.33E-08	6.01E+02
126Sn	4.70E-02	4.10E-02	8.38E-09	7.31E-09		1.78E-07	2.33E-08	7.67E+00
129I	2.00E-01	2.20E-02	5.30E-09	5.83E-10		2.65E-08	2.33E-08	1.14E+00
134Cs	1.00E-01	4.70E-02	3.19E-07	1.50E-07		3.19E-06	2.33E-08	1.37E+02
137Cs +D	2.40E-01	2.70E-01	9.60E-03	1.08E-02	4.00E-02	4.00E-02	2.33E-08	1.72E+06
137mBa	5.30E-13	1.00E-11	2.01E-14	3.79E-13		3.79E-02	2.33E-08	1.63E+06
151Sm	7.50E-04	8.40E-04	5.84E-07	6.54E-07		7.79E-04	2.33E-08	3.35E+04
152Eu	2.40E-01	3.10E-01	5.75E-08	7.43E-08		2.40E-07	2.33E-08	1.03E+01
154Eu	2.00E-01	2.50E-01	1.78E-06	2.23E-06		8.91E-06	2.33E-08	3.83E+02
155Eu	8.00E-03	9.80E-03	1.88E-07	2.30E-07		2.35E-05	2.33E-08	1.01E+03
226Ra	4.60E-01	2.50E-01	4.40E-12	2.39E-12		9.56E-12	2.33E-08	4.11E-04

AW 296-A-27 PTE Results

Analyte	CAP-88 East Area		Unabated Emissions		NDA Results	Normalized Results	NDA Gamma to Total Ratio	Maximum Analyte Value from TWINS Data Base
	Off site MPR	On site MPR	Off site MPR	On site MPR				
	mrem/Ci		mrem/yr		Ci	Ci		Ci
	B	C	D=B*G	E=C*G	F	G=H*I	H= 4.0E-02/I	I
227Ac	1.50E+01	1.80E+01	8.27E-10	9.92E-10		5.51E-11	2.33E-08	2.37E-03
228Ra	1.90E-01	7.00E-02	3.92E-09	1.45E-09		2.07E-08	2.33E-08	8.88E-01
229Th	1.60E+01	2.00E+01	7.67E-09	9.58E-09		4.79E-10	2.33E-08	2.06E-02
231Pa	1.20E+01	1.40E+01	3.10E-09	3.61E-09		2.58E-10	2.33E-08	1.11E-02
232Th	8.00E+00	1.00E+01	1.51E-08	1.88E-08		1.88E-09	2.33E-08	8.10E-02
232U	1.10E+01	1.30E+01	3.58E-07	4.23E-07		3.26E-08	2.33E-08	1.40E+00
233U	3.10E+00	3.70E+00	4.12E-07	4.92E-07		1.33E-07	2.33E-08	5.72E+00
234U	3.10E+00	3.70E+00	1.40E-06	1.67E-06		4.51E-07	2.33E-08	1.94E+01
235U	3.00E+00	3.50E+00	5.15E-08	6.01E-08		1.72E-08	2.33E-08	7.38E-01
236U	2.90E+00	3.50E+00	1.05E-07	1.26E-07		3.60E-08	2.33E-08	1.55E+00
237Np	1.20E+01	1.40E+01	1.27E-06	1.48E-06		1.06E-07	2.33E-08	4.54E+00
238Pu	7.60E+00	8.90E+00	2.12E-05	2.48E-05		2.79E-06	2.33E-08	1.20E+02
238U	2.80E+00	3.30E+00	8.79E-07	1.04E-06		3.14E-07	2.33E-08	1.35E+01
239Pu	8.20E+00	9.50E+00	1.98E-04	2.30E-04		2.42E-05	2.33E-08	1.04E+03
240Pu	8.20E+00	9.50E+00	5.97E-05	6.92E-05		7.28E-06	2.33E-08	3.13E+02
241Am	1.30E+01	1.50E+01	2.16E-04	2.49E-04		1.66E-05	2.33E-08	7.13E+02
241Pu	1.30E-01	1.50E-01	2.78E-05	3.21E-05		2.14E-04	2.33E-08	9.19E+03
242Cm	4.10E-01	5.00E-01	7.00E-09	8.53E-09		1.71E-08	2.33E-08	7.34E-01
242Pu	7.80E+00	9.10E+00	8.73E-09	1.02E-08		1.12E-09	2.33E-08	4.81E-02
243Am	1.30E+01	1.50E+01	1.58E-08	1.82E-08		1.22E-09	2.33E-08	5.23E-02
243Cm	8.50E+00	1.00E+01	1.67E-08	1.97E-08		1.97E-09	2.33E-08	8.46E-02
244Cm	6.70E+00	8.00E+00	2.94E-07	3.52E-07		4.40E-08	2.33E-08	1.89E+00
Total NDA			1.04E-02	1.14E-02				
Condensate			1.42E-02	1.59E-02				
Total PTE			2.45E-02	2.74E-02				

APPENDIX F

PTE for 296-A-46 and 47 AW Farm Exhausters

				CAP-88 - East		Unabated Emissions	
	APQ	Release Factor	Released	Off site MPR	On site MPR	Off site MPR	On site MPR
	Ci			mrem/Ci		mrem/yr	
	B	C	D=B*C	E	F	G=D*E	H=D*F
3H	2.47E+03	1.0E+00	2.5E+03	2.50E-05	7.10E-06	6.2E-02	1.8E-02
14C	4.38E+02	1.0E+00	4.4E+02	1.90E-03	1.80E-04	8.3E-01	7.9E-02
59Ni	7.44E+02	8.0E-05	6.0E-02	3.10E-04	2.90E-04	1.8E-05	1.7E-05
60Co	4.13E+03	8.0E-05	3.3E-01	2.50E-01	3.00E-01	8.3E-02	9.9E-02
63Ni	7.02E+04	8.0E-05	5.6E+00	2.60E-04	6.90E-05	1.5E-03	3.9E-04
79Se	5.38E+01	8.0E-05	4.3E-03	1.30E-01	1.50E-01	5.6E-04	6.5E-04
90Y	2.08E+07	8.0E-05	1.7E+03	3.40E-04	2.60E-04	5.7E-01	4.3E-01
90Sr	2.08E+07	8.0E-05	1.7E+03	1.10E-01	9.50E-03	1.8E+02	1.6E+01
93Zr	1.80E+03	8.0E-05	1.4E-01	1.30E-03	1.30E-03	1.9E-04	1.9E-04
93mNb	1.77E+03	8.0E-05	1.4E-01	2.10E-03	1.20E-03	3.0E-04	1.7E-04
99Tc	6.09E+03	8.0E-05	4.9E-01	2.30E-02	1.40E-03	1.1E-02	6.8E-04
106Ru	1.02E+03	8.0E-05	8.1E-02	2.00E-02	1.90E-02	1.6E-03	1.5E-03
113mCd	7.25E+03	8.0E-05	5.8E-01	1.30E-01	1.50E-01	7.5E-02	8.7E-02
125Sb	2.04E+04	8.0E-05	1.6E+00	2.60E-02	3.30E-02	4.2E-02	5.4E-02
126Sn	2.21E+02	8.0E-05	1.8E-02	4.70E-02	4.10E-02	8.3E-04	7.3E-04
129I	8.13E+00	8.0E-05	6.5E-04	2.00E-01	2.20E-02	1.3E-04	1.4E-05
134Cs	1.80E+04	8.0E-05	1.4E+00	1.00E-01	4.70E-02	1.4E-01	6.8E-02
137Cs	1.70E+07	8.0E-05	1.4E+03	2.40E-01	2.70E-01	3.3E+02	3.7E+02
137mBa	1.61E+07	8.0E-05	1.3E+03	5.30E-13	1.00E-11	6.8E-10	1.3E-08
151Sm	1.48E+06	8.0E-05	1.2E+02	7.50E-04	8.40E-04	8.9E-02	1.0E-01
152Eu	1.01E+03	8.0E-05	8.1E-02	2.40E-01	3.10E-01	1.9E-02	2.5E-02
154Eu	4.26E+04	8.0E-05	3.4E+00	2.00E-01	2.50E-01	6.8E-01	8.5E-01
155Eu	4.42E+04	8.0E-05	3.5E+00	8.00E-03	9.80E-03	2.8E-02	3.5E-02
226Ra	2.38E+02	8.0E-05	1.9E-02	4.60E-01	2.50E-01	8.8E-03	4.8E-03
227Ac	1.29E+02	8.0E-05	1.0E-02	1.50E+01	1.80E+01	1.6E-01	1.9E-01
228Ra	3.65E+01	8.0E-05	2.9E-03	1.90E-01	7.00E-02	5.6E-04	2.0E-04
229Th	2.49E+01	8.0E-05	2.0E-03	1.60E+01	2.00E+01	3.2E-02	4.0E-02
231Pa	2.70E+02	8.0E-05	2.2E-02	1.20E+01	1.40E+01	2.6E-01	3.0E-01
232U	2.73E+01	8.0E-05	2.2E-03	1.10E+01	1.30E+01	2.4E-02	2.8E-02
232Th	6.08E+00	8.0E-05	4.9E-04	8.00E+00	1.00E+01	3.9E-03	4.9E-03
233U	4.46E+02	8.0E-05	3.6E-02	3.10E+00	3.70E+00	1.1E-01	1.3E-01
234U	6.14E+01	8.0E-05	4.9E-03	3.10E+00	3.70E+00	1.5E-02	1.8E-02
235U	2.34E+00	8.0E-05	1.9E-04	3.00E+00	3.50E+00	5.6E-04	6.6E-04
236U	2.73E+00	8.0E-05	2.2E-04	2.90E+00	3.50E+00	6.3E-04	7.6E-04
237Np	5.81E+01	8.0E-05	4.7E-03	1.20E+01	1.40E+01	5.6E-02	6.5E-02
238Pu	2.95E+03	8.0E-05	2.4E-01	7.60E+00	8.90E+00	1.8E+00	2.1E+00
238U	5.06E+01	8.0E-05	4.1E-03	2.80E+00	3.30E+00	1.1E-02	1.3E-02
239Pu	2.71E+04	8.0E-05	2.2E+00	8.20E+00	9.50E+00	1.8E+01	2.1E+01
240Pu	4.86E+03	8.0E-05	3.9E-01	8.20E+00	9.50E+00	3.2E+00	3.7E+00
241Pu	6.00E+04	8.0E-05	4.8E+00	1.30E-01	1.50E-01	6.2E-01	7.2E-01
241Am	9.67E+04	8.0E-05	7.7E+00	1.30E+01	1.50E+01	1.0E+02	1.2E+02

PTE for 296-A-46 and 47 AW Farm Exhausters

				CAP-88 - East		Unabated Emissions	
	APQ	Release Factor	Released	Off site MPR	On site MPR	Off site MPR	On site MPR
	Ci			mrem/Ci		mrem/yr	
	B	C	D=B*C	E	F	G=D*E	H=D*F
242Pu	3.77E-01	8.0E-05	3.0E-05	7.80E+00	9.10E+00	2.3E-04	2.7E-04
242Cm	6.99E+01	8.0E-05	5.6E-03	4.10E-01	5.00E-01	2.3E-03	2.8E-03
243Am	1.34E+01	8.0E-05	1.1E-03	1.30E+01	1.50E+01	1.4E-02	1.6E-02
243Cm	7.92E+00	8.0E-05	6.3E-04	8.50E+00	1.00E+01	5.4E-03	6.3E-03
244Cm	2.25E+02	8.0E-05	1.8E-02	6.70E+00	8.00E+00	1.2E-01	1.4E-01
						6.4E+02	5.3E+02

APPENDIX G

241-AN 296-A-29 PTE Results

Analyte	CAP-88 East Area		Unabated Emissions		NDA Results	Normalized Results	NDA Gamma to Total Ratio	Maximum Analyte Value from TWINS Data Base
	Off site MPR	On site MPR	Off site MPR	On site MPR				
	mrem/Ci		mrem/yr		Ci	Ci		Ci
	B	C	D=B*G	E=C*G	F	G=H*I	H= 3.1E-03/I	I
3H	2.50E-05	7.10E-06	1.94E-12	5.51E-13		7.77E-08	1.57E-09	4.96E+01
14C	1.90E-03	1.80E-04	1.59E-10	1.50E-11		8.34E-08	1.57E-09	5.33E+01
60Co	2.50E-01	3.00E-01	1.94E-07	2.33E-07		7.75E-07	1.57E-09	4.95E+02
59Ni	3.10E-04	2.90E-04	2.46E-12	2.30E-12		7.92E-09	1.57E-09	5.06E+00
63Ni	2.60E-04	6.90E-05	1.95E-10	5.17E-11		7.50E-07	1.57E-09	4.79E+02
79Se	1.30E-01	1.50E-01	5.78E-10	6.67E-10		4.45E-09	1.57E-09	2.84E+00
90Sr	1.10E-01	9.50E-03	9.13E-05	7.88E-06		8.30E-04	1.57E-09	5.30E+05
90Y	3.40E-04	2.60E-04	2.82E-07	2.16E-07		8.30E-04	1.57E-09	5.30E+05
93mNb	2.10E-03	1.20E-03	1.20E-10	6.88E-11		5.73E-08	1.57E-09	3.66E+01
93Zr	1.30E-03	1.30E-03	1.04E-10	1.04E-10		7.98E-08	1.57E-09	5.10E+01
99Tc	2.30E-02	1.40E-03	3.93E-08	2.39E-09		1.71E-06	1.57E-09	1.09E+03
106Ru	2.00E-02	1.90E-02	6.95E-15	6.60E-15		3.48E-13	1.57E-09	2.22E-04
113mCd	1.30E-01	1.50E-01	4.11E-08	4.74E-08		3.16E-07	1.57E-09	2.02E+02
125Sb	2.60E-02	3.30E-02	4.52E-09	5.74E-09		1.74E-07	1.57E-09	1.11E+02
126Sn	4.70E-02	4.10E-02	1.33E-09	1.16E-09		2.83E-08	1.57E-09	1.81E+01
129I	2.00E-01	2.20E-02	2.93E-10	3.22E-11		1.46E-09	1.57E-09	9.35E-01
134Cs	1.00E-01	4.70E-02	2.46E-10	1.16E-10		2.46E-09	1.57E-09	1.57E+00
137Cs +D	2.40E-01	2.70E-01	7.44E-04	8.37E-04	3.10E-03	3.10E-03	1.57E-09	1.98E+06
137mBa	5.30E-13	1.00E-11	1.56E-15	2.94E-14		2.94E-03	1.57E-09	1.88E+06
151Sm	7.50E-04	8.40E-04	4.04E-08	4.52E-08		5.39E-05	1.57E-09	3.44E+04
152Eu	2.40E-01	3.10E-01	3.91E-09	5.05E-09		1.63E-08	1.57E-09	1.04E+01
154Eu	2.00E-01	2.50E-01	1.52E-06	1.90E-06		7.59E-06	1.57E-09	4.85E+03
155Eu	8.00E-03	9.80E-03	3.95E-08	4.83E-08		4.93E-06	1.57E-09	3.15E+03
226Ra	4.60E-01	2.50E-01	2.99E-13	1.62E-13		6.50E-13	1.57E-09	4.15E-04
228Ra	1.90E-01	7.00E-02	2.72E-10	1.00E-10		1.43E-09	1.57E-09	9.13E-01
227Ac	1.50E+01	1.80E+01	5.73E-11	6.88E-11		3.82E-12	1.57E-09	2.44E-03
229Th	1.60E+01	2.00E+01	5.31E-10	6.64E-10		3.32E-11	1.57E-09	2.12E-02
232Th	8.00E+00	1.00E+01	1.39E-09	1.74E-09		1.74E-10	1.57E-09	1.11E-01
231Pa	1.20E+01	1.40E+01	2.14E-10	2.50E-10		1.78E-11	1.57E-09	1.14E-02
232U	1.10E+01	1.30E+01	7.58E-09	8.96E-09		6.89E-10	1.57E-09	4.40E-01
233U	3.10E+00	3.70E+00	8.74E-09	1.04E-08		2.82E-09	1.57E-09	1.80E+00
234U	3.10E+00	3.70E+00	1.81E-09	2.15E-09		5.82E-10	1.57E-09	3.72E-01
235U	3.00E+00	3.50E+00	6.95E-11	8.11E-11		2.32E-11	1.57E-09	1.48E-02
236U	2.90E+00	3.50E+00	5.99E-11	7.23E-11		2.07E-11	1.57E-09	1.32E-02
238U	2.80E+00	3.30E+00	1.44E-09	1.69E-09		5.14E-10	1.57E-09	3.28E-01
237Np	1.20E+01	1.40E+01	7.12E-07	8.31E-07		5.93E-08	1.57E-09	3.79E+01
238Pu	7.60E+00	8.90E+00	1.46E-07	1.71E-07		1.93E-08	1.57E-09	1.23E+01

241-AN 296-A-29 PTE Results

Analyte	CAP-88 East Area		Unabated Emissions		NDA Results	Normalized Results	NDA Gamma to Total Ratio	Maximum Analyte Value from TWINS Data Base
	Off site MPR	On site MPR	Off site MPR	On site MPR				
	mrem/Ci		mrem/yr		Ci	Ci		Ci
	B	C	D=B*G	E=C*G	F	G=H*I	H= 3.1E-03/I	I
239Pu	8.20E+00	9.50E+00	3.15E-06	3.64E-06		3.84E-07	1.57E-09	2.45E+02
240Pu	8.20E+00	9.50E+00	5.56E-07	6.44E-07		6.78E-08	1.57E-09	4.33E+01
241Pu	1.30E-01	1.50E-01	8.16E-08	9.42E-08		6.28E-07	1.57E-09	4.01E+02
242Pu	7.80E+00	9.10E+00	3.66E-11	4.27E-11		4.70E-12	1.57E-09	3.00E-03
241Am	1.30E+01	1.50E+01	7.41E-05	8.55E-05		5.70E-06	1.57E-09	3.64E+03
243Am	1.30E+01	1.50E+01	3.03E-09	3.50E-09		2.33E-10	1.57E-09	1.49E-01
242Cm	4.10E-01	5.00E-01	5.89E-09	7.19E-09		1.44E-08	1.57E-09	9.18E+00
243Cm	8.50E+00	1.00E+01	1.02E-08	1.19E-08		1.19E-09	1.57E-09	7.63E-01
244Cm	6.70E+00	8.00E+00	5.57E-08	6.65E-08		8.31E-09	1.57E-09	5.31E+00
Total NDA			9.16E-04	9.38E-04				
Condensate			1.42E-02	1.59E-02				
Total PTE			1.51E-02	1.69E-02				

APPENDIX H

PTE for A-44 and 45 AN Farm Exhausters

				CAP-88 - East		Unabated Emissions	
	APQ	Release Factor		Off site MPR	On site MPR	Off site MPR	On site MPR
	Ci			mrem/Ci		mrem/yr	
	B	C	D=B*C	E	F	G=D*E	H=D*F
3H	2.71E+03	1.0E+00	2.7E+03	2.50E-05	7.10E-06	6.8E-02	1.9E-02
14C	5.07E+02	1.0E+00	5.1E+02	1.90E-03	1.80E-04	9.6E-01	9.1E-02
59Ni	7.70E+02	8.0E-05	6.2E-02	3.10E-04	2.90E-04	1.9E-05	1.8E-05
60Co	4.46E+03	8.0E-05	3.6E-01	2.50E-01	3.00E-01	8.9E-02	1.1E-01
63Ni	7.26E+04	8.0E-05	5.8E+00	2.60E-04	6.90E-05	1.5E-03	4.0E-04
79Se	5.70E+01	8.0E-05	4.6E-03	1.30E-01	1.50E-01	5.9E-04	6.8E-04
90Y	2.30E+07	8.0E-05	1.8E+03	3.40E-04	2.60E-04	6.3E-01	4.8E-01
90Sr	2.30E+07	8.0E-05	1.8E+03	1.10E-01	9.50E-03	2.0E+02	1.7E+01
93Zr	1.86E+03	8.0E-05	1.5E-01	1.30E-03	1.30E-03	1.9E-04	1.9E-04
93mNb	1.82E+03	8.0E-05	1.5E-01	2.10E-03	1.20E-03	3.1E-04	1.7E-04
99Tc	6.89E+03	8.0E-05	5.5E-01	2.30E-02	1.40E-03	1.3E-02	7.7E-04
106Ru	1.02E+03	8.0E-05	8.1E-02	2.00E-02	1.90E-02	1.6E-03	1.5E-03
113mCd	7.50E+03	8.0E-05	6.0E-01	1.30E-01	1.50E-01	7.8E-02	9.0E-02
125Sb	2.06E+04	8.0E-05	1.6E+00	2.60E-02	3.30E-02	4.3E-02	5.4E-02
126Sn	2.40E+02	8.0E-05	1.9E-02	4.70E-02	4.10E-02	9.0E-04	7.9E-04
129I	9.18E+00	8.0E-05	7.3E-04	2.00E-01	2.20E-02	1.5E-04	1.6E-05
134Cs	1.81E+04	8.0E-05	1.4E+00	1.00E-01	4.70E-02	1.4E-01	6.8E-02
137Cs	1.85E+07	8.0E-05	1.5E+03	2.40E-01	2.70E-01	3.6E+02	4.0E+02
137mBa	1.75E+07	8.0E-05	1.4E+03	5.30E-13	1.00E-11	7.4E-10	1.4E-08
151Sm	1.53E+06	8.0E-05	1.2E+02	7.50E-04	8.40E-04	9.2E-02	1.0E-01
152Eu	1.06E+03	8.0E-05	8.4E-02	2.40E-01	3.10E-01	2.0E-02	2.6E-02
154Eu	4.63E+04	8.0E-05	3.7E+00	2.00E-01	2.50E-01	7.4E-01	9.3E-01
155Eu	4.56E+04	8.0E-05	3.6E+00	8.00E-03	9.80E-03	2.9E-02	3.6E-02
226Ra	2.38E+02	8.0E-05	1.9E-02	4.60E-01	2.50E-01	8.8E-03	4.8E-03
227Ac	1.30E+02	8.0E-05	1.0E-02	1.50E+01	1.80E+01	1.6E-01	1.9E-01
228Ra	3.87E+01	8.0E-05	3.1E-03	1.90E-01	7.00E-02	5.9E-04	2.2E-04
229Th	2.49E+01	8.0E-05	2.0E-03	1.60E+01	2.00E+01	3.2E-02	4.0E-02
231Pa	2.70E+02	8.0E-05	2.2E-02	1.20E+01	1.40E+01	2.6E-01	3.0E-01
232U	2.79E+01	8.0E-05	2.2E-03	1.10E+01	1.30E+01	2.5E-02	2.9E-02
232Th	6.16E+00	8.0E-05	4.9E-04	8.00E+00	1.00E+01	3.9E-03	4.9E-03
233U	4.48E+02	8.0E-05	3.6E-02	3.10E+00	3.70E+00	1.1E-01	1.3E-01
234U	6.76E+01	8.0E-05	5.4E-03	3.10E+00	3.70E+00	1.7E-02	2.0E-02
235U	2.58E+00	8.0E-05	2.1E-04	3.00E+00	3.50E+00	6.2E-04	7.2E-04
236U	2.87E+00	8.0E-05	2.3E-04	2.90E+00	3.50E+00	6.7E-04	8.0E-04
237Np	6.20E+01	8.0E-05	5.0E-03	1.20E+01	1.40E+01	5.9E-02	6.9E-02
238Pu	3.04E+03	8.0E-05	2.4E-01	7.60E+00	8.90E+00	1.8E+00	2.2E+00
238U	5.61E+01	8.0E-05	4.5E-03	2.80E+00	3.30E+00	1.3E-02	1.5E-02
239Pu	2.92E+04	8.0E-05	2.3E+00	8.20E+00	9.50E+00	1.9E+01	2.2E+01
240Pu	5.25E+03	8.0E-05	4.2E-01	8.20E+00	9.50E+00	3.4E+00	4.0E+00
241Pu	6.40E+04	8.0E-05	5.1E+00	1.30E-01	1.50E-01	6.7E-01	7.7E-01
241Am	1.03E+05	8.0E-05	8.2E+00	1.30E+01	1.50E+01	1.1E+02	1.2E+02

PTE for A-44 and 45 AN Farm Exhausters

				CAP-88 - East		Unabated Emissions	
	APQ	Release Factor		Off site MPR	On site MPR	Off site MPR	On site MPR
	Ci			mrem/Ci		mrem/yr	
	B	C	D=B*C	E	F	G=D*E	H=D*F
242Pu	4.05E-01	8.0E-05	3.2E-05	7.80E+00	9.10E+00	2.5E-04	2.9E-04
242Cm	7.57E+01	8.0E-05	6.1E-03	4.10E-01	5.00E-01	2.5E-03	3.0E-03
243Am	1.37E+01	8.0E-05	1.1E-03	1.30E+01	1.50E+01	1.4E-02	1.6E-02
243Cm	8.35E+00	8.0E-05	6.7E-04	8.50E+00	1.00E+01	5.7E-03	6.7E-03
244Cm	2.36E+02	8.0E-05	1.9E-02	6.70E+00	8.00E+00	1.3E-01	1.5E-01
						6.9E+02	5.7E+02

APPENDIX I

241-AP 296-A-40 PTE Results

Analyte	CAP-88 East Area		Unabated Emissions		NDA Results	Normalized Results	NDA Gamma to Total Ratio	Maximum Analyte Value from TWINS Data Base
	Off site MPR	On site MPR	Off site MPR	On site MPR				
	mrem/Ci		mrem/yr		Ci	Ci		Ci
	B	C	D=B*G	E=C*G	F	G=H*I	H=9.1E-03/I	I
3H	2.50E-05	7.10E-06	6.16E-11	1.75E-11		2.46E-06	1.02E-08	2.42E+02
14C	1.90E-03	1.80E-04	7.58E-10	7.18E-11		3.99E-07	1.02E-08	3.92E+01
60Co	2.50E-01	3.00E-01	1.49E-07	1.79E-07		5.95E-07	1.02E-08	5.85E+01
59Ni	3.10E-04	2.90E-04	2.14E-11	2.00E-11		6.90E-08	1.02E-08	6.78E+00
63Ni	2.60E-04	6.90E-05	1.51E-09	4.02E-10		5.82E-06	1.02E-08	5.72E+02
79Se	1.30E-01	1.50E-01	4.18E-09	4.82E-09		3.22E-08	1.02E-08	3.16E+00
90Sr	1.10E-01	9.50E-03	3.08E-05	2.66E-06		2.80E-04	1.02E-08	2.75E+04
90Y	3.40E-04	2.60E-04	9.52E-08	7.28E-08		2.80E-04	1.02E-08	2.75E+04
93mNb	2.10E-03	1.20E-03	1.03E-09	5.90E-10		4.92E-07	1.02E-08	4.83E+01
93Zr	1.30E-03	1.30E-03	8.84E-10	8.84E-10		6.80E-07	1.02E-08	6.68E+01
99Tc	2.30E-02	1.40E-03	1.66E-07	1.01E-08		7.22E-06	1.02E-08	7.09E+02
106Ru	2.00E-02	1.90E-02	2.14E-13	2.03E-13		1.07E-11	1.02E-08	1.05E-03
113mCd	1.30E-01	1.50E-01	3.40E-07	3.92E-07		2.62E-06	1.02E-08	2.57E+02
125Sb	2.60E-02	3.30E-02	5.61E-08	7.12E-08		2.16E-06	1.02E-08	2.12E+02
126Sn	4.70E-02	4.10E-02	4.00E-09	3.49E-09		8.52E-08	1.02E-08	8.37E+00
129I	2.00E-01	2.20E-02	3.18E-09	3.49E-10		1.59E-08	1.02E-08	1.56E+00
134Cs	1.00E-01	4.70E-02	1.60E-07	7.51E-08		1.60E-06	1.02E-08	1.57E+02
137Cs +D	2.40E-01	2.70E-01	2.18E-03	2.46E-03	9.10E-03	9.10E-03	1.02E-08	8.94E+05
137mBa	5.30E-13	1.00E-11	4.56E-15	8.61E-14		8.61E-03	1.02E-08	8.46E+05
151Sm	7.50E-04	8.40E-04	3.52E-07	3.94E-07		4.69E-04	1.02E-08	4.61E+04
152Eu	2.40E-01	3.10E-01	3.08E-08	3.98E-08		1.28E-07	1.02E-08	1.26E+01
154Eu	2.00E-01	2.50E-01	1.69E-06	2.11E-06		8.43E-06	1.02E-08	8.28E+02
155Eu	8.00E-03	9.80E-03	1.76E-08	2.15E-08		2.20E-06	1.02E-08	2.16E+02
226Ra	4.60E-01	2.50E-01	2.75E-12	1.49E-12		5.98E-12	1.02E-08	5.87E-04

241-AP 296-A-40 PTE Results

Analyte	CAP-88 East Area		Unabated Emissions		NDA Results	Normalized Results	NDA Gamma to Total Ratio	Maximum Analyte Value from TWINS Data Base
	Off site MPR	On site MPR	Off site MPR	On site MPR	Ci	Ci		Ci
	mrem/Ci		mrem/yr					
	B	C	D=B*G	E=C*G	F	G=H*I	H=9.1E-03/I	I
228Ra	1.90E-01	7.00E-02	2.36E-09	8.69E-10		1.24E-08	1.02E-08	1.22E+00
227Ac	1.50E+01	1.80E+01	5.25E-10	6.30E-10		3.50E-11	1.02E-08	3.44E-03
229Th	1.60E+01	2.00E+01	4.54E-09	5.68E-09		2.84E-10	1.02E-08	2.79E-02
232Th	*8.00E+00*	*1.00E+01*	4.71E-09	5.89E-09		5.89E-10	1.02E-08	5.79E-02
231Pa	1.20E+01	1.40E+01	1.92E-09	2.24E-09		1.60E-10	1.02E-08	1.57E-02
232U	1.10E+01	1.30E+01	1.35E-08	1.60E-08		1.23E-09	1.02E-08	1.21E-01
233U	3.10E+00	3.70E+00	1.57E-08	1.87E-08		5.05E-09	1.02E-08	4.96E-01
234U	3.10E+00	3.70E+00	6.47E-09	7.72E-09		2.09E-09	1.02E-08	2.05E-01
235U	3.00E+00	3.50E+00	2.53E-10	2.95E-10		8.44E-11	1.02E-08	8.29E-03
236U	2.90E+00	3.50E+00	2.72E-10	3.28E-10		9.37E-11	1.02E-08	9.21E-03
238U	2.80E+00	3.30E+00	5.02E-09	5.91E-09		1.79E-09	1.02E-08	1.76E-01
237Np	1.20E+01	1.40E+01	2.31E-06	2.69E-06		1.92E-07	1.02E-08	1.89E+01
238Pu	7.60E+00	8.90E+00	5.83E-08	6.83E-08		7.67E-09	1.02E-08	7.54E-01
239Pu	8.20E+00	9.50E+00	4.17E-07	4.84E-07		5.09E-08	1.02E-08	5.00E+00
240Pu	8.20E+00	9.50E+00	7.89E-08	9.14E-08		9.62E-09	1.02E-08	9.45E-01
241Pu	1.30E-01	1.50E-01	1.80E-08	2.08E-08		1.38E-07	1.02E-08	1.36E+01
242Pu	7.80E+00	9.10E+00	7.48E-12	8.73E-12		9.59E-13	1.02E-08	9.42E-05
241Am	1.30E+01	1.50E+01	5.70E-06	6.58E-06		4.39E-07	1.02E-08	4.31E+01
243Am	1.30E+01	1.50E+01	2.12E-10	2.44E-10		1.63E-11	1.02E-08	1.60E-03
242Cm	4.10E-01	5.00E-01	8.18E-10	9.98E-10		2.00E-09	1.02E-08	1.96E-01
243Cm	8.50E+00	1.00E+01	5.09E-09	5.99E-09		5.99E-10	1.02E-08	5.88E-02
244Cm	6.70E+00	8.00E+00	9.48E-08	1.13E-07		1.41E-08	1.02E-08	1.39E+00
Total NDA			2.23E-03	2.47E-03				
Condensate			1.42E-02	1.59E-02				
Total PTE			1.64E-02	1.84E-02				

APPENDIX J

SY Tank Farm PTE Based on NDA Results taken on August 22, 2002

Total Waste Inventory from TWINS3 as of 7/24/02								CAP-88 Factors for 200 West Area		Unabated Emissions	
Analyte	Sum of Tanks	Ratio Analyte/Cs137	Analyte to NDA Results Normalized Values	NDA Results	SY-101	SY-102	SY-103	Off site MPR	On site MPR	Off site MPR	On site MPR
	Ci		Ci	Ci	Ci	Ci	Ci	mrem/Ci	mrem/Ci	mrem/yr	mrem/yr
Formulas	A	$B=A_i/A_{Cs\text{-}137}$	$C=B_i*C_{Cs\text{-}137}$					D	E	F=C*D	G=C*E
3H	1.05E+03	4.15E-04	3.53E-05		8.14E+02	2.37E+02	1.75E+00	2.5E-05	1.1E-05	8.8E-10	3.9E-10
14C	3.60E+01	1.42E-05	1.21E-06		3.71E+00	2.84E+01	3.86E+00	2.0E-03	3.0E-04	2.4E-09	3.6E-10
60Co	1.45E+02	5.72E-05	4.87E-06		8.16E+01	1.71E+01	4.64E+01	1.9E-01	3.4E-01	9.3E-07	1.7E-06
59Ni	3.18E+00	1.25E-06	1.07E-07		1.10E+00	6.49E-01	1.43E+00	2.4E-04	3.3E-04	2.6E-11	3.5E-11
63Ni	2.97E+02	1.17E-04	9.97E-06		1.03E+02	6.11E+01	1.33E+02	2.0E-04	7.8E-05	2.0E-09	7.8E-10
79Se	4.31E+00	1.70E-06	1.45E-07		8.92E-01	4.16E-01	3.00E+00	1.0E-01	1.6E-01	1.4E-08	2.3E-08
90Sr	2.17E+05	8.55E-02	7.28E-03		7.15E+04	7.21E+04	7.33E+04	8.8E-02	1.1E-02	6.4E-04	8.0E-05
90Y	2.17E+05	8.55E-02	7.28E-03		7.15E+04	7.21E+04	7.33E+04	2.6E-04	2.9E-04	1.9E-06	2.1E-06
93Zr	4.92E+01	1.94E-05	1.65E-06		5.78E+00	1.41E+01	2.93E+01	9.9E-04	1.5E-03	1.6E-09	2.5E-09
93mNb	4.21E+01	1.66E-05	1.41E-06		5.26E+00	1.21E+01	2.47E+01	1.6E-03	1.3E-03	2.3E-09	1.8E-09
99Tc	2.41E+03	9.51E-04	8.09E-05		9.32E+02	4.49E+02	1.03E+03	1.8E-02	1.8E-03	1.5E-06	1.5E-07
106Ru	2.43E-04	9.59E-11	8.16E-12		9.37E-05	4.34E-05	1.06E-04	*1.2E-02*	*1.5E-02*	9.8E-14	1.2E-13
113mCd	2.90E+02	1.14E-04	9.74E-06		1.11E+02	5.33E+01	1.26E+02	1.0E-01	1.6E-01	9.7E-07	1.6E-06
126Sn	9.62E+00	3.79E-06	3.23E-07		3.69E+00	1.77E+00	4.16E+00	3.7E-02	4.6E-02	1.2E-08	1.5E-08
125Sb	1.35E+02	5.32E-05	4.53E-06		5.23E+01	2.36E+01	5.90E+01	2.1E-02	3.7E-02	9.5E-08	1.7E-07
129I	2.54E+00	1.00E-06	8.51E-08		7.67E-01	7.18E-01	1.05E+00	7.6E-02	8.1E-03	6.5E-09	6.9E-10
134Cs	3.08E+00	1.21E-06	1.03E-07		1.31E+00	4.57E-01	1.31E+00	7.8E-02	1.0E-01	8.1E-09	1.0E-08
137Cs	2.54E+06	1.00E+00	8.51E-02	8.51E-02	8.91E+05	4.75E+05	1.17E+06	1.9E-01	3.1E-01	1.6E-02	2.6E-02
137mBa	2.40E+06	9.47E-01	8.06E-02		8.43E+05	4.49E+05	1.11E+06	8.6E-14	1.7E-12	6.9E-15	1.4E-13
151Sm	5.34E+04	2.11E-02	1.79E-03		2.05E+04	9.80E+03	2.31E+04	5.8E-04	9.5E-04	1.0E-06	1.7E-06
152Eu	1.34E+01	5.30E-06	4.51E-07		5.21E+00	2.36E+00	5.87E+00	1.9E-01	3.4E-01	8.6E-08	1.5E-07
154Eu	1.93E+03	7.60E-04	6.47E-05		5.56E+02	2.41E+02	1.13E+03	1.5E-01	2.8E-01	9.7E-06	1.8E-05
155Eu	1.52E+03	5.99E-04	5.09E-05		6.37E+02	1.50E+02	7.31E+02	6.3E-03	1.1E-02	3.2E-07	.5.6E-07
226Ra	7.10E-04	2.80E-10	2.38E-11		2.73E-04	1.30E-04	3.07E-04	3.6E-01	2.9E-01	8.6E-12	6.9E-12

SY Tank Farm PTE Based on NDA Results taken on August 22, 2002

Total Waste Inventory from TWINS3 as of 7/24/02								CAP-88 Factors for 200 West Area		Unabated Emissions	
Analyte	Sum of Tanks	Ratio Analyte/Cs137	Analyte to NDA Results Normalized Values	NDA Results	SY-101	SY-102	SY-103	Off site MPR	On site MPR	Off site MPR	On site MPR
	Ci		Ci	Ci	Ci	Ci	Ci	mrem/Ci	mrem/Ci	mrem/yr	mrem/yr
Formulas	A	$B=A_i/A_{Cs\text{-}137}$	$C=B_i*C_{Cs\text{-}137}$					D	E	F=C*D	G=C*E
228Ra	3.80E-01	1.50E-07	1.28E-08		1.05E-01	5.60E-02	2.19E-01	1.5E-01	7.9E-02	1.9E-09	1.0E-09
227Ac	1.10E-01	4.33E-08	3.68E-09		2.84E-03	1.05E-01	1.89E-03	1.1E+01	2.0E+01	4.1E-08	7.4E-08
229Th	1.17E-02	4.60E-09	3.92E-10		4.71E-03	1.65E-03	5.31E-03	1.2E+01	2.2E+01	4.7E-09	8.6E-09
232Th	6.71E-02	2.65E-08	2.25E-09		2.15E-02	3.54E-02	1.02E-02	6.2E+00	1.1E+01	1.4E-08	2.5E-08
231Pa	9.74E-01	3.84E-07	3.27E-08		7.52E-03	9.58E-01	8.48E-03	8.9E+00	1.5E+01	2.9E-07	4.9E-07
232U	6.82E-01	2.69E-07	2.29E-08		1.00E-01	1.05E-01	4.77E-01	8.6E+00	1.5E+01	2.0E-07	3.4E-07
233U	2.79E+00	1.10E-06	9.38E-08		4.11E-01	4.33E-01	1.95E+00	2.4E+00	4.2E+00	2.3E-07	3.9E-07
234U	8.66E-01	3.41E-07	2.91E-08		1.16E-01	2.44E-01	5.06E-01	2.4E+00	4.2E+00	7.0E-08	1.2E-07
235U	3.53E-02	1.39E-08	1.18E-09		4.69E-03	1.02E-02	2.04E-02	2.3E+00	4.0E+00	2.7E-09	4.7E-09
236U	2.55E-02	1.00E-08	8.54E-10		3.64E-03	5.92E-03	1.59E-02	2.3E+00	3.9E+00	2.0E-09	3.3E-09
238U	7.95E-01	3.13E-07	2.67E-08		1.05E-01	2.31E-01	4.59E-01	2.1E+00	3.7E+00	5.6E-08	9.9E-08
237Np	3.66E+00	1.44E-06	1.23E-07		7.21E-01	1.71E+00	1.23E+00	8.9E+00	1.6E+01	1.1E-06	2.0E-06
238Pu	5.59E+02	2.21E-04	1.88E-05		1.15E+00	5.55E+02	3.31E+00	5.9E+00	1.0E+01	1.1E-04	1.9E-04
239Pu	3.98E+03	1.57E-03	1.34E-04		4.14E+01	3.82E+03	1.19E+02	6.4E+00	1.1E+01	8.5E-04	1.5E-03
240Pu	8.89E+02	3.51E-04	2.98E-05		7.05E+00	8.62E+02	2.03E+01	6.4E+00	1.1E+01	1.9E-04	3.3E-04
241Pu	3.54E+03	1.40E-03	1.19E-04		5.92E+01	3.31E+03	1.70E+02	1.0E-01	1.6E-01	1.2E-05	1.9E-05
242Pu	2.07E-01	8.15E-08	6.94E-09		4.56E-04	2.05E-01	1.31E-03	6.1E+00	1.0E+01	4.2E-08	6.9E-08
241Am	2.52E+04	9.94E-03	8.46E-04		4.58E+02	2.35E+04	1.25E+03	9.8E+00	1.7E+01	8.3E-03	1.4E-02
243Am	4.57E-01	1.80E-07	1.53E-08		1.63E-02	3.96E-01	4.46E-02	9.8E+00	1.7E+01	1.5E-07	2.6E-07
242Cm	4.47E+00	1.76E-06	1.50E-07		1.20E+00	6.16E-02	3.21E+00	3.2E-01	5.7E-01	4.8E-08	8.6E-08
243Cm	8.48E-01	3.34E-07	2.85E-08		9.70E-02	4.91E-01	2.60E-01	6.6E+00	1.2E+01	1.9E-07	3.4E-07
244Cm	1.48E+01	5.83E-06	4.96E-07		8.51E-01	1.17E+01	2.23E+00	5.2E+00	9.0E+00	2.6E-06	4.5E-06
			NDA						Sum	2.6E-02	4.3E-02
			4817	hr					Annual	4.8E-02	7.8E-02
			8760	hr/yr					Condensate		1.8E-02
			0.55	fraction					PTE		9.6E-02

APPENDIX K

241-SX-296-S-15 PTE Results

Analyte	CAP-88 West Area		Unabated Emissions		NDA	Normalized	NDA	Total
	Off site MPR	On site MPR	Off site MPR	On site MPR	Gamma	Result	Gamma to	SX Tanks
	mrem/Ci		mrem/yr		Result	Ci	Total SX Farm Ratio	Ci
	B	C	D=B*G	E=C*G	F	G=H*I	H=1.7E-02/I	I
3H	2.50E-05	1.10E-05	7.64E-11	3.36E-11		3.06E-06	7.48E-09	4.09E+02
14C	2.00E-03	3.00E-04	6.36E-10	9.54E-11		3.18E-07	7.48E-09	4.25E+01
59Ni	2.40E-04	3.30E-04	1.62E-10	2.22E-10		6.73E-07	7.48E-09	9.00E+01
60Co	1.90E-01	3.40E-01	1.87E-07	3.34E-07		9.83E-07	7.48E-09	1.31E+02
63Ni	2.00E-04	7.80E-05	1.24E-08	4.83E-09		6.20E-05	7.48E-09	8.29E+03
79Se	1.00E-01	1.60E-01	3.37E-09	5.40E-09		3.37E-08	7.48E-09	4.51E+00
90Y	2.60E-04	2.90E-04	2.42E-05	2.70E-05		9.31E-02	7.48E-09	1.25E+07
90Sr	8.80E-02	1.10E-02	8.20E-03	1.02E-03		9.31E-02	7.48E-09	1.25E+07
93Zr	9.90E-04	1.50E-03	1.84E-09	2.79E-09		1.86E-06	7.48E-09	2.49E+02
93mNb	1.60E-03	1.30E-03	2.50E-09	2.03E-09		1.56E-06	7.48E-09	2.09E+02
99Tc	1.80E-02	1.80E-03	1.97E-07	1.97E-08		1.09E-05	7.48E-09	1.46E+03
106Ru	1.60E-02	2.20E-02	1.09E-14	1.50E-14		6.81E-13	7.48E-09	9.10E-05
113mCd	1.00E-01	1.60E-01	1.62E-07	2.59E-07		1.62E-06	7.48E-09	2.17E+02
125Sb	2.10E-02	3.70E-02	1.13E-08	2.00E-08		5.40E-07	7.48E-09	7.22E+01
126Sn	3.70E-02	4.60E-02	5.44E-09	6.76E-09		1.47E-07	7.48E-09	1.97E+01
129I	7.60E-02	8.10E-03	9.04E-10	9.63E-11		1.19E-08	7.48E-09	1.59E+00
134Cs	7.80E-02	1.00E-01	4.66E-10	5.97E-10		5.97E-09	7.48E-09	7.99E-01
137Cs	1.90E-01	3.10E-01	3.23E-03	5.27E-03	1.70E-02	1.70E-02	7.48E-09	2.27E+06
137mBa	8.60E-14	1.70E-12	1.38E-15	2.73E-14		1.61E-02	7.48E-09	2.15E+06
151Sm	5.80E-04	9.50E-04	1.96E-06	3.21E-06		3.38E-03	7.48E-09	4.52E+05
152Eu	1.90E-01	3.40E-01	1.20E-07	2.14E-07		6.30E-07	7.48E-09	8.43E+01
154Eu	1.50E-01	2.80E-01	5.62E-06	1.05E-05		3.74E-05	7.48E-09	5.01E+03
155Eu	6.30E-03	1.10E-02	8.56E-08	1.49E-07		1.36E-05	7.48E-09	1.82E+03
226Ra	3.60E-01	2.90E-01	8.63E-13	6.95E-13		2.40E-12	7.48E-09	3.21E-04
227Ac	1.10E+01	2.00E+01	7.95E-10	1.45E-09		7.23E-11	7.48E-09	9.67E-03
228Ra	1.50E-01	7.90E-02	2.82E-11	1.49E-11		1.88E-10	7.48E-09	2.52E-02
229Th	1.20E+01	2.20E+01	7.76E-12	1.42E-11		6.47E-13	7.48E-09	8.65E-05
231Pa	8.90E+00	1.50E+01	5.81E-09	9.80E-09		6.53E-10	7.48E-09	8.73E-02
232U	8.60E+00	1.50E+01	3.77E-09	6.57E-09		4.38E-10	7.48E-09	5.86E-02
232Th	*6.20E+00*	1.10E+01	1.38E-11	2.44E-11		2.22E-12	7.48E-09	2.97E-04
233U	2.40E+00	4.20E+00	6.45E-08	1.13E-07		2.69E-08	7.48E-09	3.59E+00
234U	2.40E+00	4.20E+00	2.26E-07	3.96E-07		9.42E-08	7.48E-09	1.26E+01
235U	2.30E+00	4.00E+00	8.89E-09	1.55E-08		3.86E-09	7.48E-09	5.17E-01
236U	2.30E+00	3.90E+00	5.26E-09	8.93E-09		2.29E-09	7.48E-09	3.06E-01
237Np	8.90E+00	1.60E+01	5.68E-07	1.02E-06		6.38E-08	7.48E-09	8.54E+00
238Pu	5.90E+00	1.00E+01	6.80E-06	1.15E-05		1.15E-06	7.48E-09	1.54E+02
238U	2.10E+00	3.70E+00	1.77E-07	3.11E-07		8.42E-08	7.48E-09	1.13E+01
239Pu	6.40E+00	1.10E+01	2.30E-04	3.95E-04		3.59E-05	7.48E-09	4.80E+03
240Pu	6.40E+00	1.10E+01	4.75E-05	8.16E-05		7.42E-06	7.48E-09	9.92E+02
241Pu	1.00E-01	1.60E-01	3.27E-06	5.23E-06		3.27E-05	7.48E-09	4.37E+03
241Am	9.80E+00	1.70E+01	5.55E-04	9.63E-04		5.66E-05	7.48E-09	7.58E+03

241-SX-296-S-15 PTE Results

242Pu	6.10E+00	1.00E+01	1.89E-09	3.09E-09		3.09E-10	7.48E-09	4.14E-02
242Cm	3.20E-01	5.70E-01	2.04E-08	3.63E-08		6.36E-08	7.48E-09	8.51E+00
243Am	9.80E+00	1.70E+01	3.86E-07	6.70E-07		3.94E-08	7.48E-09	5.27E+00
243Cm	6.60E+00	1.20E+01	2.65E-08	4.82E-08		4.01E-09	7.48E-09	5.37E-01
244Cm	5.20E+00	9.00E+00	4.46E-07	7.72E-07		8.57E-08	7.48E-09	1.15E+01
Total			1.23E-02	7.80E-03				
Total/5			2.46E-03					

APPENDIX L

242-S, 296-S-18 PTE Results

Radionuclide	Pump Room Air Sample Results	Condenser Room Air Sample Results	Potential Release	CAP-88 East Area		Unabated Emissions	
				Off site MPR	On site MPR	Off site MPR	On site MPR
	µCi/ml	µCi/ml	Ci	mrem/Ci		mrem/yr	
	B	C	D =vt*(B*pp+C*pc)	E	F	G=D*E	H=D*F
alpha (Am-241)	8.0E-12	8.3E-12	3.5E-04	1.30E+01	1.50E+01	4.50E-03	5.2E-03
beta (Cs-137)	8.0E-09	1.3E-11	1.8E-01	2.40E-01	2.70E-01	4.38E-02	4.9E-02
					Total	4.83E-02	5.45E-02

Percent Flow For Pump Room Air Sample - (pp)	53.7%			
Percent Flow For Condenser Room Air Sample - (pc)	46.3%			
Total Annual Flow (m^3) - (vt)	4.25E+07			

APPENDIX M

242-T Evaporator 296-T-17 PTE Estimate

Radionuclide	CAP-88 West Area		Unabated Emissions		NDA	Normalized	NDA	Total
	Off site MPR	On site MPR	Off site MPR	On site MPR	Gamma	Result	Gamma to	TX Farm
	mrem/Ci		mrem/yr		Result	Ci	Total TX Farm Ratio	Ci
	B	C	D=B*G	E=C*G	F	G=H*I	H=5.4E-04/I	I
3H	2.50E-05	1.10E-05	2.83E-12	1.25E-12		1.13E-07	2.46E-10	4.61E+02
14C	2.00E-03	3.00E-04	3.52E-11	5.28E-12		1.76E-08	2.46E-10	7.16E+01
59Ni	2.40E-04	3.30E-04	1.67E-11	2.30E-11		6.98E-08	2.46E-10	2.84E+02
60Co	1.90E-01	3.40E-01	2.81E-08	5.02E-08		1.48E-07	2.46E-10	6.01E+02
63Ni	2.00E-04	7.80E-05	1.31E-09	5.10E-10		6.54E-06	2.46E-10	2.66E+04
79Se	1.00E-01	1.60E-01	1.88E-10	3.00E-10		1.88E-09	2.46E-10	7.63E+00
90Sr	8.80E-02	1.10E-02	1.13E-05	1.41E-06		1.28E-04	2.46E-10	5.22E+05
90Y	2.60E-04	2.90E-04	3.34E-08	3.72E-08		1.28E-04	2.46E-10	5.22E+05
93mNb	1.60E-03	1.30E-03	1.34E-10	1.09E-10		8.37E-08	2.46E-10	3.40E+02
93Zr	9.90E-04	1.50E-03	9.92E-11	1.50E-10		1.00E-07	2.46E-10	4.08E+02
99Tc	1.80E-02	1.80E-03	1.08E-08	1.08E-09		6.02E-07	2.46E-10	2.45E+03
106Ru	1.60E-02	2.20E-02	4.03E-16	5.54E-16		2.52E-14	2.46E-10	1.02E-04
113mCd	1.00E-01	1.60E-01	9.10E-09	1.46E-08		9.10E-08	2.46E-10	3.70E+02
125Sb	2.10E-02	3.70E-02	2.57E-10	4.54E-10		1.23E-08	2.46E-10	4.99E+01
126Sn	3.70E-02	4.60E-02	3.09E-10	3.84E-10		8.35E-09	2.46E-10	3.40E+01
129I	7.60E-02	8.10E-03	4.79E-11	5.11E-12		6.30E-10	2.46E-10	2.56E+00
134Cs	7.80E-02	1.00E-01	2.32E-11	2.97E-11		2.97E-10	2.46E-10	1.21E+00
137Cs	1.90E-01	3.10E-01	1.03E-04	1.67E-04	5.40E-04	5.40E-04	2.46E-10	2.20E+06
137mBa	8.60E-14	1.70E-12	4.38E-17	8.66E-16		5.09E-04	2.46E-10	2.07E+06
151Sm	5.80E-04	9.50E-04	3.09E-08	5.07E-08		5.33E-05	2.46E-10	2.17E+05
152Eu	1.90E-01	3.40E-01	1.62E-09	2.90E-09		8.54E-09	2.46E-10	3.47E+01
154Eu	1.50E-01	2.80E-01	7.85E-08	1.47E-07		5.24E-07	2.46E-10	2.13E+03
155Eu	6.30E-03	1.10E-02	1.34E-09	2.34E-09		2.12E-07	2.46E-10	8.64E+02
226Ra	3.60E-01	2.90E-01	8.80E-14	7.09E-14		2.45E-13	2.46E-10	9.95E-04
227Ac	1.10E+01	2.00E+01	8.87E-11	1.61E-10		8.07E-12	2.46E-10	3.28E-02
228Ra	1.50E-01	7.90E-02	2.77E-12	1.46E-12		1.85E-11	2.46E-10	7.52E-02
229Th	1.20E+01	2.20E+01	7.65E-13	1.40E-12		6.37E-14	2.46E-10	2.59E-04
231Pa	8.90E+00	1.50E+01	6.58E-10	1.11E-09		7.40E-11	2.46E-10	3.01E-01
232Th	*6.20E+00*	1.10E+01	1.42E-12	2.53E-12		2.30E-13	2.46E-10	9.35E-04
232U	8.60E+00	1.50E+01	8.87E-10	1.55E-09		1.03E-10	2.46E-10	4.20E-01
233U	2.40E+00	4.20E+00	1.52E-08	2.66E-08		6.33E-09	2.46E-10	2.58E+01
234U	2.40E+00	4.20E+00	1.29E-08	2.25E-08		5.37E-09	2.46E-10	2.18E+01
235U	2.30E+00	4.00E+00	5.33E-10	9.27E-10		2.32E-10	2.46E-10	9.42E-01
236U	2.30E+00	3.90E+00	2.14E-10	3.63E-10		9.30E-11	2.46E-10	3.78E-01
237Np	8.90E+00	1.60E+01	2.32E-08	4.17E-08		2.61E-09	2.46E-10	1.06E+01
238Pu	5.90E+00	1.00E+01	3.31E-07	5.61E-07		5.61E-08	2.46E-10	2.28E+02
238U	2.10E+00	3.70E+00	1.10E-08	1.94E-08		5.24E-09	2.46E-10	2.13E+01
239Pu	6.40E+00	1.10E+01	1.07E-05	1.84E-05		1.67E-06	2.46E-10	6.80E+03
240Pu	6.40E+00	1.10E+01	2.19E-06	3.76E-06		3.42E-07	2.46E-10	1.39E+03
241Am	9.80E+00	1.70E+01	2.59E-05	4.49E-05		2.64E-06	2.46E-10	1.07E+04
241Pu	1.00E-01	1.60E-01	2.37E-07	3.79E-07		2.37E-06	2.46E-10	9.64E+03

242-T Evaporator 296-T-17 PTE Estimate

242Cm	3.20E-01	5.70E-01	4.82E-10	8.59E-10		1.51E-09	2.46E-10	6.13E+00
242Pu	6.10E+00	1.00E+01	1.34E-10	2.19E-10		2.19E-11	2.46E-10	8.90E-02
243Am	9.80E+00	1.70E+01	1.38E-08	2.39E-08		1.41E-09	2.46E-10	5.72E+00
243Cm	6.60E+00	1.20E+01	3.57E-10	6.48E-10		5.40E-11	2.46E-10	2.20E-01
244Cm	5.20E+00	9.00E+00	6.49E-09	1.12E-08		1.25E-09	2.46E-10	5.08E+00
Total			1.53E-04	2.37E-04				

POTENTIAL-TO-EMIT PEER-REVIEW CHECKLIST

Source of PTE Factors: *Calculating Potential-to-Emit Radiological Releases and Doses* (DOE/RL-2006-29)

PTE Application: Tank Farms Stack Designation Determinations RPP-29791 R0
Description of application (e.g., NOC or stack determination)

Yes	No	NA	
[X]	[ ]	[ ]	Assumptions and/or factors explicitly stated and supported, which include approved PTE method used (or description of alternate method, if applicable), radionuclide inventory, and, as applicable, pollution abatement equipment in use.
[X]	[ ]	[ ]	Decontamination factors, airborne dose factors, releases fractions, and/or similar emission reduction factors accurately used in calculations and technically justified.
[X]	[ ]	[ ]	Applicable pollution abatement equipment entirely accounted for in calculations.
[X]	[ ]	[ ]	Appropriate dose-per-unit-release factors and/or facility-specific calculations were used.
[X]	[ ]	[ ]	Sources of data used in calculations identified.
[X]	[ ]	[ ]	Mathematical formulas accurate.
[X]	[ ]	[ ]	Hand-calculations (including spreadsheets) checked for errors.
[X]	[ ]	[ ]	Sufficient documentation is available to support all essential aspects of the PTE determination.

[ ] [ ] **Document approved by:** **Lucinda Penn**
Name, printed

Approval Signature: Lucinda Penn

Date: 06/25/07